Challenges and Opportunities of Urban Smallholder Farmers in a Metropolis: A Case Study in the City of Cape Town

by

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DEDICATIONS

This dissertation is dedicated to my family, especially my mother, Noluthando Kabane, and my late grandmother, Mamtolo Kabane.

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DECLARATION OF INDEPENDENT WORK

I, Thamsanqa Kabane, hereby declare that this research study, submitted to the Central University of Technology for the awarding of the degree **Master of Agriculture,** is my own work and has not previously been submitted to any tertiary institution, by me or any other person, for the awarding of a qualification.

Thamsanqa Kabane

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ABSTRACT

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This study investigates challenges and opportunities faced by urban smallholder farmers in the City of Cape Town metropolis. The study was conducted in five districts using 39 smallholder farmers in the metropolis as respondents. Based on the surveys employed for the purpose of this study, a structured questionnaire was used to collect data through face-to-face interviews. The questions contained in the questionnaire were both open- and closed- ended. In this study, attributes such as age, gender, highest academic qualification, farming experience, locality and region were asked.

Enterprises covered include vegetable crops (at Philippi, Khayelitsha and Kraaifontein); bee farming (Somerset West); as well as eggs and crops (Atlantis). In the study, 48,7% of the respondents were female and 51,3% male. The survey found that 15 of the 39 respondents (38,5%) use a computer in their farming. Educational levels of respondents were found to be low (Grade R to Grade 7) in Khayelitsha (71,4%) followed by Atlantis district (20,0%). This is in line with many studies conducted in South Africa and other developing countries among similar groups of smallholder farmers.

The results of the study suggest that more attention must be given to supporting smallholder farmers in all five study areas to ensure that they engage in agricultural

commercial production. To facilitate more opportunities for smallholder farmers, support systems should include provision of infrastructure development; supportive policy environment; institutional support services; and measures to improve the management level of smallholder farmers.

The implication of this is that it is important for policymakers to know that a vital requirement of smallholder farmers' is access to markets, therefore localising markets in centres can improve agricultural production.

Despite opportunities that have been created to facilitate participation of smallholder farmers in the economy, these farmers continue to face numerous challenges that limit their ability to participate in commercial agriculture. Policymakers should create an enabling environment for smallholder farmers and empower them to produce high quantities of good-quality products on a regular basis.

Key words: smallholder farmers, marketing, infrastructure, production factors and agricultural produce

ACRONYMS

AB : Abalimi Bezekhaya

ADBG : African Development Bank Group

ACORD : Agency for Cooperation and Research in Development

AM : Amahlathi Municipality

ADM : Amathole District Municipality

CCT : City of Cape Town

DAWC : Department of Agriculture: Western Cape

DAFF : Department of Agriculture, Forestry and Fisheries

DRDLR : Department of Rural Development and Land Reform

EC : Eastern Cape

FSP : Farmer Support Programme

ICAE : International Conference of Agricultural Economists

KZN : KwaZulu Natal

LP : Limpopo Province

MAPA : Marketing of Agricultural Products Act

MFPP : Massive Food Production Programme

NM : Nkonkobe Municipality

SA : South Africa

SWP : Silwindlala Woman's Project

StatsSA : Statistics South Africa

SSA : Sub-Saharan Africa

UN : United Nations

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CHAPTER 1: INTRODUCTION

This chapter offers information about the reasons that informed this study and facilitates an understanding of the issues around smallholder farmers in South Africa. It firstly outlines the definition of key terms followed by a background of the study and the problem statement. Objectives of the study and research questions also form part of this chapter. In addition, the chapter discusses hypotheses and the anticipated significance of the study, followed by the chapter outline of the research report.

1.1 Definition of key terms

1.1.1 Smallholder farmer

Smallholder farmers are defined in various ways depending on the country, context, and ecological zone, for example, subsistence farmers, backyard farmers or upcoming farmers (DAFF, 2012). One such definition simply describes smallholders in terms of their inadequate resource availability in relation to other farmers in the sector (DAFF, 2012). In general, most smallholder farmers' production methods are characterised by out-dated technologies, low returns, high seasonal labour variations, and women occupying an important role in the production system (DAFF, 2012). Smallholder agriculture in South Africa has been identified as the vehicle through which poverty can be alleviated and rural growth can be accomplished (Pienaar & Traub, 2015). General descriptions of the smallholder sector include reference to the type of commodities produced, use of family labour, farming as principal source of income, and lack of access to operation funding. The United Nations declared 2014 the International Year of Family Farming (IYFF) to recognize the importance of family farming in reducing poverty and improving global food security.

Smallholder farmers are frequently regarded in terms of market orientation. Smallholder farmers primarily produce for their own consumption. It is less customary for these farmers to produce for the markets (in addition to consumption production) and even less likely for them to produce mainly for the markets (Aid environment, 2013). In developing countries, a distinction is made between producing for local, national, and international markets. A further feature used to identify smallholder farmers is the

management responsibility of the farm. These farmers provide the majority of labour input required on the farm, but do not necessarily have much knowledge on how to farm. Many of these farmers participate in out grower schemes (also known as contract farming), where the farmer's responsibility and independence with regard to decision-making are constrained by contractual requirements. Several certification systems have detailed the changed needs of the different types of smallholders, based on management responsibility. The farming (or production) system can also be used as an indicator to define smallholders. Smallholders are frequently thought to have diversified farming systems, and subsequently low productivity (Aid environment, 2013).

Even although some smallholder farmers' income is supplemented by substantial off-farm income, they are still susceptible to adverse climatic and economic conditions. Smallholder farmers are frequently weak in terms of supply chain management and are generally less resourced compared to commercial large-scale farmers. Smallholder farmers produce relatively small volumes of crops on relatively small plots of land. They often rely on family workers, but may also use hired labour (WIEGO, 2014). Smallholder farmers face a range of challenges that limit their development and capacity to contribute to food security effectively and substantially, in comparison to the commercial farmers. Other limitations facing smallholder farmers are a lack of access to land as well as poor physical and institutional infrastructure. According to DAFF (2012), poor roads, a lack of information, high transaction costs, poor agricultural network, a lack of reliable markets, out-dated technology, poor transport conditions, poor financial management, and a lack of skills may be some of the constraints that obstruct their growth. It is estimated that South Africa has 2,5 million smallholder farmers compared to the 35000 commercial farming units in operation in the country. In terms of land occupation smallholder farmers occupy 3 million hectares of farmland in the country, compared to the 82,5 million hectares dedicated to commercial agriculture (Nkomo, 2013).

1.1.2 Small-scale farmer

Small-scale sector farming is defined by Kutya (2012) as the production of crops and livestock on a small piece of land with no utilisation of sophisticated and expensive technologies. However, the definition of size of these farms is a topic of debate. It can

be argued that these farmers are practising on pieces of family land and are using of traditional land on urban areas for farming purposes. Small-scale farmers are farmers who sometimes have access to small pieces of land, that is, only a couple of hundred square metres, such as home gardens and food plots where they mostly have between three and five hectares available. Kirsten and Van Zyl (1998) argue that there is sufficient global proof that small-scale agriculture has the potential to create employment and income opportunities in rural areas. They maintain that small-scale farmers are potentially competitive in certain activities and that, with positive policy support; these opportunities can be developed into feasible positions for a future smallholder sector. According to SIFT, the Small-scale Intensive Farm Training program (SIFT, 2017), this sector is a natural product of sustainable agriculture, which produces sufficient food without compromising the earth's resources or polluting its environment. It is agriculture that pursues the philosophy of nature to increase systems for raising crops and livestock that are natural and self-sustaining.

Small-scale farmers usually also take responsibility for their own financing and marketing. Small-scale farmers' use of external inputs is very restricted as they mainly depend on internal (home) inputs, for example, seeds, manure, and green fertilisers. Greenberg (2013) argues that a small-scale farmer is defined as having a gross farm income of less than R500 000 per annum. These farmers are also considered to usually have less than 20 ha of land. Small-scale farmers are inclined to farm their plots commercially and occasionally get assistance from extension services with regard to technology, access to inputs such as plant material, agrochemicals, irrigation, as well as market information. Extension services are a common feature of the administrative structure of rural areas and these services have the responsibility, in partnership with the farmers, of directing programmes and projects for change. Most of the small-scale farms are controlled by elderly females and usually obtain technology support in the form of conventional inputs and practices. According to Murphy (2012), small-scale farmers are frequently held back due to poor access to inputs, technologies, and good quality seed. Limited access to motorised transportation, capital markets, credit, and information about markets marginalise the small-scale farmer.

1.1.3 Communal farmer

Communal farmers tend to be a subgroup of small-scale farmers and generally farm on small-sized plots or projects established or sustained, to varying degrees, by the provincial departments of agricultural extension services. Communal farming sustains the rural population which is primarily not agriculture-focused due to population density, varying rainfall, an inadequate availability of arable soil, and limited intention of running a farming operation (De Lange, 1994). Communal farmers participate in farming activities in rural areas. These farmers are faced with many challenges, such as land degradation, the increase of human settlement onto farmland, theft, drought, unproductive land, conflict among farmers and other community members, high transport costs, poor or no infrastructure (e.g. dams, fences, dipping containers), while motorists also complain about livestock that cause accidents when crossing roads (Mashala, 2014).

Communal farming is one of the world's oldest agricultural systems and is predominately practised by rural households in developing countries, particularly in Africa. To date, this practice appears to be extremely resilient to economic disasters. This farming sector is associated with enhanced household food security in poverty-stricken areas of South Africa. No accurate or quantifiable information on its contribution to job creation is available (Mmbengwa et al., 2015).

The researchers' definition of smallholder farmers is those farmers with a lack of access to land, poor physical infrastructure, limited institutional infrastructure and restricted working capital. A smallholder farmer has limited information regarding, among others, market trends, product planning, current prices, sales timing, and market prices.

1.2 Background of the study

On 14 March 2007, the City of Cape Town adopted an urban agricultural policy that aims, among other things, to develop an integrated and holistic approach for the effective and meaningful development of urban agriculture in the City of Cape Town. The policy is used as a directing tool by all responsible role players to bring in line and synergise attempts to maximise the optimistic force of urban agriculture in the

metropolis. The policy aims to create conditions whereby public, private, and civil society agents can work together to improve the potential for sustainable local economic development. The policy document focuses on agricultural activities by the poorest of the poor in the urban areas. It includes the benefits, negative impacts, challenges, and opportunities for the development of urban agriculture. The policy excludes large-scale commercial farming and other agricultural farming activities outside the urban area of the City of Cape Town. The term urban agriculture refers to the production, processing, marketing, and distribution of crops and animals and products from farmers in an urban environment that are utilising accessible resources to the benefit of residents of that area (City of Cape Town, 2007 and Van Averbeke, 2007). It is believed that urban agriculture can be a cost-efficient primary driver for job creation. The aim of the metropolis is to meaningfully support the challenge of achieving household food security in the region by ensuring that people get adequate, safe, and nutritious food. The integration of urban agriculture into the surrounding big commercial agriculture will be improved and expedited by using the same suppliers, support services, markets, and research systems as the commercial farmers. The criteria used by the city to render assistance is based on the type and scale of urban agricultural activity, such as home-based activities, community-based activities, micro-farmers and small emerging farmers. The metropolis determines whether a proposed activity is suitable for a specific site and reconcilable with the immediate surroundings before it is approved. The assessments conducted include, among others, environmental health impacts, visual impacts, and characteristics of the specific area. The City has identified land available for urban agriculture (City of Cape Town, 2007).

The main objectives of the policy are to:

- Establish a common vision for urban agriculture in the City of Cape Town;
- Identify key enabling imperatives and strategic aims to direct urban agricultural development;
- Establish an urban agricultural support programme by the City;
- Define the responsibility and job of stakeholders in creating an institutional framework that can aid in the development of urban agriculture; and
- Establish consultative forums for stakeholder contribution and consultation (City of Cape Town, 2007).

Urban agriculture is gaining increasing prominence in South African cities and towns. At the beginning of 1990s, it was estimated that 25% of households in metropolitan Durban were cultivating a garden for subsistence food production and 10% were selling produce (Phuhlisani, 2008).

Undoubtedly, urban agriculture creates an important input into the food self-reliance of numerous major cities. Furthermore, it contributes to the food security of various major cities, both as a vital part of the urban food method and as a way for vulnerable people to reduce their food-insecurity challenge. The extent of urban agriculture is commonly underrated. According to the general, broadly-accepted assessment, globally about 200 million urban dwellers now participate in urban agriculture, providing 800 million people with at least some of their food. Over the previous couple of years, urban farming has increasingly achieved recognition as a feasible intervention approach for urban poor to get extra money (Armar-Klemesu, 2000).

The aim of the study is to highlight the challenges and opportunities of smallholder farmers in the metropolis. Poor rural people migrate to the cities with the hope of finding employment, but given the relatively small prospect of finding work, these people usually end up becoming “the urban poor”.

Urban farming assists people who arrive in the cities from rural areas to resume elements of the rural activities (social and physical) which they left behind. Worldwide, one of the strategies poor urban people adopt to mitigate poverty and improve their food security is urban agriculture (Van Averbeke, 2007).

1.2.1 Problem statement

Smallholder farmers need information regarding, among others, product planning, current prices, forecasted market trends, timing of sales, improved marketing practices, and group marketing (Ozowa, 1995). A worrying factor is the inability of smallholder farmers to participate in market-oriented production due to their limited access to markets, capital, inputs (seeds, insecticides and fertilizers), technology, and extension services. Studies have indicated that smallholder farmers do participate in farming, marketing and make a considerable contribution to the production of high-value food

commodities, but their access to the markets is limited. The Land Bank (2011) outlined inhibiting factors affecting smallholder farmers' performance such as age, formal education, experience, land, and economies of scale. According to Mudhara (2010), smallholder farmers have numerous objectives, meaning that they do not have one answer to changes in economic stimuli. Market failure occurs largely due to poor infrastructure which may be at the development stage.

Mostly, small-scale farmers do not have adequate post-harvest storage and handling capabilities which results in high levels of spoilage and loss of harvested produce (Binns, 2012). Smallholder farmers face challenges due to inadequate entrepreneurial knowledge and an inability to keep up with market dynamics. Many smallholder farmers persist in producing the crops they have traditionally produced and continue searching for markets for the produce even when the market needs have altered, changed or moved to other products. Smallholder farmers usually revert back to a poor marketing system after the required output has already been produced (Kawa & Kaitira, 2007). Smallholder support, at basic level, might be required for the supply of water for irrigation, infrastructure, provision of an improved extension service, provision of transport, sanitation, access to cheaper capital, access to markets, access to market information, support with packaging, housing and collection points, support with forming cooperatives, information about risk management, avoidance and control, assistance with management in general, variety of products, and marketing the product (Louw, 2013).

Smallholder farmers face the challenge of supplying consistent volumes of a quality product but find it hard to enter into contracts with suppliers or retailers. For smallholder farmers to enter into the value chain will require investment in irrigation, greenhouses, trucks, cooling sheds and packaging technologies. They will also need capacity to grade and sort, document farming practices, and manage timing and delivery deadlines (Greenberg & Paradza, 2013). Armour (2013) is also of the opinion that for smallholder farmers to enter into the value chain will require to be traceable; have required information; bulk, uniformity, and surety of supply; created brands and brand knowledge; and phytosanitary requirements such as hazard analysis and critical control points.

Some of the challenges facing smallholder farmers are partly related to markets that are

lacking and weak, or non-existent credit markets, information markets, labour markets, and land markets. Farming methods are generally low in technology and/or capital, labour intensive, and dominated by female farmers. Smallholder sector farmers face increased risk when they are exposed to an uncertain and changing environment (Perret & Stevens, 2006). The different constraints facing smallholder farmers in South Africa and the significance of the sector in agricultural production is well-documented, according to Nwafor (2015). Delgado (1999) also reaffirms the significance of the sector in terms of providing employment, human well-being, and political stability, and highlighted that the crucial need for these farmers to develop their competitiveness through participating in the agricultural food supply chain in a profitable and sustainable way.

These farmers also face challenges due to inadequate levels of entrepreneurial skills and a lack of understanding of market dynamics.

1.2.2 Significance of the study

The study will add knowledge on the practices and constraints facing smallholder farmers in the Cape Town metropolis in the Western Cape. These results can be used to the advantage of smallholder farmers, among others, by advancing their farm marketing skills, and will hopefully, influence government policy and behaviour. Smallholder farmers are important for employment, human welfare, and political stability in Sub-Saharan Africa. Furthermore, small-scale farmers can moderate the rural exodus, generate growth opportunities, and has the potential to expand the market for industrial goods (Cousins, 2000). Internationally observed evidence illustrates that small-scale farmers in developing countries are in some cases considered to be more efficient (or at least as efficient) given a level playing field, than large-scale farmers (Kirsten & Van Zyl, 1998). This study is crucial to pinpointing the inefficiencies and weaknesses being experienced by smallholder farmers producing vegetables, honey, and eggs in the City of Cape Town metropolis, and suggests possible policy recommendations to smallholder farmers.

1.2.3 Objectives of the study

Before suggesting possible strategies to support smallholder farmers, it is necessary to identify the specific challenges with which they are faced. Emphasis is placed on the best way to support smallholder farmers in their effort to access markets.

The overall objective of this study will be to determine the challenges faced by urban smallholder farmers and the available support from government and the Cape Town metropolis.

The specific objectives are:

1. To identify the management, infrastructural and institutional challenges and constraints facing smallholder farmers in the City of Cape Town metropolis;
2. To assess the support available from government and other organisations for smallholder farmers in the City of Cape Town; and
3. To recommend possible strategies that policymakers can consider for implementation to assist smallholder farmers.

1.2.4 Research questions

The overall research questions of this study are:

- What are the management constraints, infrastructural and institutional limitations facing smallholder farmers in the City of Cape Town metropolis?
- What is the role played by government and other institutions to ensure that smallholder farmers are assisted?
- What are the possible strategies that policymakers can consider for implementation to support smallholder farmers?

1.2.5 Hypotheses

1. H_1: Smallholder farmers in this study are faced with various challenges which limit their ability to perform.

2. H_2: There are support systems in place at the various levels of government to assist these farmers.

1.2.6 Outline of the study

This study consists of five chapters. Chapter 1 provides an overview of the study, highlighting the definition of key terms, background, problem statement; significance of the study, objectives of the study, research questions and hypothesis. The literature review regarding some aspects of smallholder farming in South Africa is discussed in Chapter 2.

Chapter 3 explains the methodology used to collect data and the geographical location of the study area, while Chapter 4 presents the results of the study, paying more attention on the overview of demographics of respondents. The final chapter, Chapter 5, contains the conclusions, recommendations, and areas identified in this study as requiring further research.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter reviewed selective aspects regarding smallholder farming. The literature reviewed, presents an overview of smallholder farming in South Africa, as well as the characteristics and importance of smallholder farmers. From the literature, it then further identifies constraints to smallholder agriculture, the history of irrigation development, agricultural development, and cooperatives. For better understanding of the contribution of smallholder farmers, it is necessary to review the agricultural commercialisation, agricultural and economic development, the human dimensions, and factors affecting the adoption of technology. The conclusion reached forms the final part of the chapter.

2.2 Smallholder farmers in South Africa

The term smallholder farmer is extensively debated in South Africa. DAFF (2013: 1) defines smallholder farmers as “those producers who produce food for home consumption, as well as sell surplus produce to the market”, meaning that earning an income is a conscious objective, as distinct from “subsistence or resource-poor” producers who produce mainly or entirely for own consumption”. South African agriculture can be best explained as a twofold system of farming. The first is farming by a well-resourced and well-capitalised commercial agricultural sector that contributes considerably towards the country’s food security.

The second system is farming by a less resourced and less developed farming system in use by smallholder farmers (Kirsten & Van Zyl, 1998; Thamaga-Chitja & Morojele, 2014; and Pote, 2008). In South Africa, smallholder farming is typically associated with the poorest populations of the country, characterised by vulnerability in terms of weak livelihood prospects and household food security. This sector does not receive sufficient support from policymakers. The majority of smallholder farmers in developing countries such as South Africa are from lower educated, vulnerably poor communities in rural areas with less developed infrastructure, which places them in the second economy (Thamaga-Chitja & Morojele, 2014).

Generally, smallholder farmers do not have sufficient post-harvest storage and handling capacity which results in extensive levels of loss (crops, eggs and honey) of harvested produce (Binns, 2012). Smallholder farmer's face social challenges, such as limited formal education and literacy that can impair their ability to negotiate equitable commercial contracts with customers and suppliers; register for land rights; apply for governmental support programmes; and participate in institutional programmes. Among the challenges smallholder farmers face, WIEGO (2014) reports that these farmers produce relatively small food crops on relatively small plots of land; mostly and are less well-resourced compared to commercial farmers; they might be men or woman; and they are known to be part of the informal economy because they may not be registered and tend to be excluded from aspects of labour legislation, have little or no social protection, and keep inadequate records. Mdlalose (2016) found that smallholder farmers are described according to size of the land available to them and that most have access to a very small portion of land – occasionally only a couple of hundred square metres, such as food plots and home gardens of perhaps three to five hectares. Smallholder farmers are known for their small labour-intensive farms, using traditional production techniques and often lacking institutional support and capacity (Pienaar & Traub, 2015).

According to Mudhara (2010) smallholder farmers largely produce to provide their own subsistence food requirements mostly to compensate for the failure of the marketing system. These farmers are often unable to sell their produce mainly due to poor infrastructure, such as poor or non-existent roads and transport that is unavailable or expensive. Distribution and transport constraints prevent smallholder farmers from freely participating in the market. The challenges facing smallholder farmers have major implications on market access; Raphela (2014) indicates that inadequate market information on the side of farmers frequently puts them in a poor bargaining situation when marketing their agricultural produce.

A lack of credit facilities is disadvantageous to the gaining of capital goods. As a result of institutional challenges, farmers are likely to be subjected to a range of market limitations. Baiyegunhi and Fraser (2014) highlighted that South African smallholder farmers have limited access to production, information, credit, and markets, and are repeatedly constrained by high transaction costs. In South Africa, credit can be accessed from either the formal or informal financial sector. The formal financial sector

is well developed and highly concentrated in urban areas in terms of both available services and the amount of transactions. The major providers of financial services are the commercial banks. Banks target clients with ownership of fairly high value mortgageable property or people who have payslips as proof of employment or collateral for loans, which most poor smallholder farmers do not have. Smallholder producers are frequently marginalised by a lack of access to inputs, quality of land, smart technology such as irrigation systems, and good quality seeds (Murphy, 2012).

Loeper et al., (2016) argue that South African smallholder farmers find it challenging to participate in the modern economy. The smallholder sector is faced by the challenge of limited extension services due to staffing constraints in the Department of Agriculture, Forestry and Fisheries. Thamaga-Chitja and Morojele (2014) acknowledge the important role played by smallholder farmers in improving household food security, especially nutrition. These farmers are well-positioned to play an important role in the future world food security. Smallholder agriculture in South Africa has been recognised as the vehicle through which the objectives of rural development and poverty reduction can be realised (Pienaar & Traub, 2015).

These farmers produce and deliver about 70% of Africa's entire food needs and supply approximately 80% of the food consumed in both Asia and sub-Saharan Africa. Furthermore, smallholder farmers in a number of developing countries produce the volume of these countries' main agricultural exports. However, despite the important contribution they have, smallholder farmers are overlooked by policymakers as well as the international community. According to Khue et al., (2016) it was found that smallholder farmers are the most important source of employment as well as food security. Agriculture has the potential to generate close to 1 million new jobs by 2030, half of which would be directly from the smallholder sector.

2.3 Characteristics of the smallholder farmer

2.3.1 Size of the smallholder farm

Kirsten and Van Zyl (1998) claim that many people judge small-scale farming according to the farm size available to them. According to Ngemntu (2010) farm size alone is not

always a good measure for categorising the small-scale sector. In the South African context, judgement is based on the farm's sustainability on its land without bearing in mind other characteristics such as specific farm enterprise and managerial capability. Moyo (2010) categorises the smallholder sector according to land size, production purpose (whether for home consumption or market), income level (whether rich or poor), and in South Africa, ethnic group (whether one is white or black and thus historically advantaged or disadvantaged, respectively).

"Defining the "viable farm" in terms of size alone had a profoundly negative effect on the relative profitability of farms smaller than the viable size" (Kirsten& Van Zyl, 1998: 562). The criterion used to define the small-scale farmer must not be based on the size of the available farm but rather on the capability of the farm, for example, small-scale farming on one hectare of irrigated peri-urban land, appropriate for vegetable crops has an increased profit prospect compared to 500 hectares of low-quality land in the Karoo. Turnover, or rather the level of net farm income, defines the farm size category, not the land.

A Fairtrade International report (2013) and Mugera (2013) argue that some cash crops rely mostly on family labour. Land area may be a poor economic (as opposed to geographic) degree of farm size mean. This is because land is so changeable in its agricultural characteristics and farms of various types can require massively different areas of land for the same value of output. The fact that there is not a robust small farming sector in South Africa contributes to the confusion about small-scale farming (Ngemntu, 2010).

2.3.2 Low level of production technology

Despite the lack of technology, smallholder farmers are expected to continue playing an important role in agriculture and reducing poverty, especially in developing countries (Murray et al., 2016). Technologies work best if they are adapted and accepted by beneficiaries. These technologies must give the best potential welfare advantage to the proposed user group and boost the beneficiaries' ability to utilise it (Asuming-Brempong et al., 2016). Mukasa (2016) sees technological changes in the agricultural sector for Sub-Sahara countries as one of the solutions to alleviating food insecurity, boosting

economic growth, and improving the living conditions of the populations. Ngemntu (2010) and Pote (2008) found that smallholder farmers in South Africa are characterised by basic production technology based on the fact that the sector is labour-intensive with minimal usage of machinery (technology).

The low level of technology creates uncertainty for farmers which places them at risk due to a lack of information about the long-term profits to be derived from technology. Baloyi (2010) argues that the smallholder sector's lack of access to technology has a detrimental effect on its capacity to access markets locally and internationally. To be feasible, the technology needs to be suitable for the present farming system, that is, the entire livelihood system which includes the social, economic, and institutional context of smallholder farmers, the strategy developed by farmers, and the challenges they face. Technology is defined in different ways by various authors. Perret and Stevens (2006) define a technique or a technology as a way to produce or organise, out of any context (invention), whereas a practice is a technique, 'borrowed' by a social and economic context (innovation). In the case of smallholder farmers, it is for both social and economic circumstances.

New technologies should not only benefit the financial security of farmers, but also be accommodative of culture, which includes beliefs, norms, and values. It is impossible for smallholder farmers to adopt technologies without access to all applicable information, that is, complete information that clearly defines and recognises the expected returns after adoption. Muzari et al., (2012) identifies the main factors affecting technology adoption, among others, as income, assets, and labour by smallholder farmers in Sub-Saharan Africa. Technology is defined as an adoption of the combination of an existing practice into a new technology, typically continued by adaptation in the environmental changes. Technological adoption may become instrumental in agricultural growth realisation, far beyond the more direct objectives of growing production and satisfying food and nutritional needs as well as the alleviation of poverty. Agriculture in South Africa for the small-scale sector is dominated by labour-intensive practices and very limited use of advanced technology. Small-scale farmers partially utilise technology by making use of hoes for planting, watering cans for irrigation, and occasionally hired labour for harvesting if the amount of work exceeds what the family labourers can manage (Ngemntu, 2010). Small-scale farmers of South Africa are not financially strong; therefore, they are mostly incapable to buy advanced

technology. They are incapable to attain and utilise modern or advanced technology due to a lack of experience, available finance, and required infrastructure. The level of adoption of technology, particularly the modern technology models by the small-scale sector of South Africa, is low. In summary, the lack of financial backing makes it extremely problematic for smallholder farmers to commence technological assumption.

2.3.3 Computer use

It is generally accepted that the use of a personal computer to conduct research (via the internet) and using other programmes (such as Excel for data storage, Word for writing letters, and PowerPoint for presentations) can improve the effectiveness in the agricultural sector. Personal computer use and internet availability can develop communication and assist in the exchange of knowledge and skills; and are considered to be of the most important technologies (Adamides et al., 2013). Ngeywo et al., (2015) acknowledge age as a solution to increasing the adoption rate of technology and consequent activities as farmers engage in farming. Computers play a very important role in farm management (Gonzalez, 2012). Brookes et al., (1992) describe a number of planning tasks which can be executed by using computerised models.

These include calculation of nutrient requirements for specific production objectives and/or production attainable from detailed nutrient intakes and/or implications; diet formulation by means of linear programming to give best possible combinations of dietary elements at lowest cost; distribution of pasture to grazing animals based on tasks describing herbage allowance, and medium- to long-term feed planning by means of models that range from easy feed budgets to active entire farm reproduction. Iddings and Apps (1990) argue that a dairy farmer with 40 or 50 cows needs to retain a lot of information manually, but now can depend on the computer as a base of memory. Using a computer for a variety of purposes, such as record-keeping, enables the farmers to work thoroughly and allows data to be stored safely on the computer (Reenen, 1989). Computer use is important in that it helps farm managers to make crucial decisions regarding their farms (Gonzalez, 2012). Growing developments in the use of computers and the internet by agricultural producers mean that many farmers have seen positive growth and increased profits due to the use of technology (Smith et al., 2004).

A number of studies mention that older adults (over 67 years of age) experience a major challenge with regard to the use of computers. The elderly is reported to have numerous cognitive and physiological disadvantages, the inclination to use computers is low (particularly among females and people who have a lower education), and they panic or feel nervous of computers (Aula, 2004). The reasons for using computers are diverse, some are motivated by the likely gains, some thought they had to study it, and some had personal motives for learning. According to Smith (2014), Americans of about 65 years of age and older have historically been late adopters of technology compared to their younger compatriots, but their progress into the digital era continues to increase, according to research by the Pew Research Centre.

Those younger than 65 years of age, who are mostly highly educated, have quite substantial technology adoption, and also have an optimistic view regarding the advantages of online platforms. Iddings and Apps (1990) hold that several farmers believe the old saying “you cannot teach an old dog new tricks” and that farmers often consider themselves as learned. They will rather leave it to the younger generation. This means that only a few are able to, or willing to learn, to use a computer. However, the saying is not true, and anyone who is willing and has the determination can to learn to use a computer in a relatively short period of time (Reenen, 1989). The aim of this study is to describe the data by investigating the distribution of scores on each variable and by determining whether the scores on different variables regarding the use of computer are related to each other.

Adamides et al., (2013) noted that older farmers are more likely to be traditionalists than modernisers. According to Smith et al. (2004), it was found that age is the relevant factor in computer use as younger farmers are likely to have more knowledge regarding computers. The effect of age on business-related internet use is smaller than for personal computer ownership and declines after the age of 35 (Smith et al., 2004).

2.3.4 Support services

DAFF (2012) acknowledges the smallholder sector as the means by which poverty could be alleviated in many economies in developing countries, even though its potential is not always recognised. Compared to commercial farmers, smallholder

farmers in South Africa face various constraints that inhibit their growth and capability to successfully contribute to food security. As discussed in Chapter 4: Government support to respondents (Page 88), smallholder agricultural growth is impossible to achieve without access to support services. In order to boost agricultural productivity all problems need to be addressed concurrently. Senyolo (2007) agrees with the view that an inclusive approach to the provision of support services is essential to accomplish growth in the smallholder farming. The South African government has established a number of farmer support programmes to address the risk of a lack of ability and financial and/or economic experience in the smallholder sector (Sikwela & Mushenje, 2013). Interventions have been introduced to help these smallholder farmers to alleviate poverty through agricultural production. Unfortunately, the smallholder sector is further faced with institutional obstacles which include limited access to information, a lack of technical skills, as well as high marketing and transaction costs.

Aliber and Hall (2012) highlighted the importance of farmer support programmes in the late 1980s that attempted to supply holistic assistance to farmers in the various homelands. Similarly, the Massive Food Production Programme in the Eastern Cape in 2003 was an attempt to considerably boost land use and agricultural production. According to Hornby and Cousins (2016), the support programmes must be based on an understanding of the fundamental dynamics of smallholder farmers generally. Such initiatives would differentiate between the needs and requirements of different types of smallholder farmers. Current policies require to be realigned and/or new policies should be set in place to avoid the marginalisation of small-scale farmers (Louw et al., 2008). The research conducted by Khapayi and Celliers (2015) found that the supply of support services is one of the main essential involvements in the agricultural sector for commercialisation, food security, poverty alleviation and income generation. DAFF (2013) identified the need to support the smallholder sector to ensure food security, full use of resources, land being one of the critical ones, job creation and the complete achievement of the Presidential Outcomes, especially Outcome 7.

Most smallholder farmers have various sources of livelihood such as off-farm income; thus, being a smallholder farmer does not necessarily mean farming as a full-time activity or even key source of household income. The motive for introducing an initiative to support smallholder farmers is the fact that there is proof to suggest that this is an area in which there remains much unused potential to generate economic opportunities,

especially in rural locations where poverty is always concentrating. DAFF (2013) created the Strategic Plan for Smallholder Support (SPSS) to address direct constraints facing small-scale farmers, in the medium and long term. SPSS recommends six key mechanisms or methods to improve support to the smallholder farmers. These include (a) improved planning and investment coordination; (b) massifying investment in skills; (c) initiating a stronger and more coherent approach to partnerships; (d) revising and refining infrastructure and mechanisation support programmes; (e) upscaling scheme-based interventions; and (f) phasing in and expanding systemic interventions.

The support system is provided in line with the current funding mechanism referred to as CASP (Comprehensive Agricultural Support Programme). CASP has six pillars, namely on and off-farm infrastructure and product inputs, technical and advisory assistance, information and technology management, regulatory services, training and capacity building and marketing and business development, and financial support, which has since been branded as the Mafisa, and the Ilima/Letsema pillars and other sustainable farming models which seek to promote risk sharing between producers and financial institutions. DAFF has undertaken to establish and support an additional 50 000 new smallholder farmers by 2014/15 (DAFF, 2013). This support should also be extended to assist current smallholder farmers to graduate towards becoming large-scale commercial producers.

2.4 Importance of smallholder farmers

2.4.1 Promotion of food security

According to DAFF (2012), smallholder farmers can play a significant role in creating livelihoods for the rural poor. At the same time, Ngemntu (2010) and Pote (2008) found that while smallholder production is important for household food security, the productivity of the smallholder sector is fairly limited. It is necessary to increase the productivity of this sector to guarantee long-term food security.

This can be accomplished by, among others, persuading this sector to continue sustainably strengthening production growth through improved inputs. For this reason, DAFF (2013) established programmes to support the smallholder sector to ensure food

security among the vulnerable poor. There is significant proof to be certain that the smallholder sector has a vast potential to grow and expand and thus, meaningfully contribute to alleviating South Africa's food security challenges. There is extensive proof in the literature to suggest that measures that improve the smallholder farmers' ability to increase food production and productivity, by linking them to markets, will improve their purchasing potential and increase broader food accessibility.

"Food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (Mdlalose, 2016: 11). Food security has three major components, namely: 1) availability – appropriate food must be available on a regular basis, in an adequate quantities; 2) access – people to resources must be of adequate means or have access to food in sufficient quantities, either through purchase, home production, or food aid; and 3) utilisation or consumption – people must have adequate dietary intake of food that has a helpful nutritional impact.

South Africa is among the developing countries facing the constraints of food insecurity (Pote, 2008). Numerous scholars argue that food insecurity is not a consequence of an underperforming commercial agricultural sector. Further attention is needed, in collaboration with the smallholder sector, to eliminate technical, institutional, and entrepreneurial challenges.

2.4.2 Employment creation

Agriculture plays a significant role in the economy of most of the developing countries in the world. According to Khue et al., (2016) and Pote (2008), the smallholder sector plays a crucial role in employment creation in developing countries – especially Sub-Saharan Africa. Agriculture has the potential to generate close to a million new jobs by 2030, of which about half would be in the smallholder sector constituting self-employment. Studies conducted (Pote, 2008) noted that in the Limpopo Province, the smallholder sector was contributing 25 percent of the employment for economic active citizens. This indicates that wherever there is energetic contribution in agriculture, there is an additional reward of employment.

The extensive literature review in this chapter provided various opinions regarding the immense potential of the smallholder sector to prosper and expand, and thereby contributing greatly to alleviating the country's persistent unemployment problem. Smallholder farmers tend to use labour-intensive methods rather than ones that are capital-intensive. If this sector is appropriately capacitated, it will be able to attract more workers and use land more intensively (DAFF, 2013). The smallholder sector contributes to employment creation by hiring labour to assist them during harvesting time, marketing their produce when products are transported to the market, and by supplying hawkers (Mdlalose, 2016).

Employment creation is one of government's main priorities, as specified in the National Development Plan (NDP) 2030 and the Department of Trade and Industry's New Growth Path (NGP) in 2016. Both stress the significance of the agricultural sector's role in creating employment. Greyling (2012) notes the sector's capacity to create employment with the potential to create a million employment opportunities. This could be accomplished by increasing irrigation agriculture, cultivating underutilised land in areas performing below productivity levels, and supporting labour-intensive agricultural sectors and districts, and supporting the creation of upstream and downstream industries. Greyling (2012) also argues that 300 000 employment opportunities can be created through improved utilisation of land in the former homeland areas, with an additional 326500 potential employment opportunities upstream and downstream of the agricultural sector.

According to Simelane (2011), the agricultural sector in developing countries employs a large number of labourers. Statistics show that 35% of the population is employed either directly or indirectly in the agricultural sector. Simelane (2011) further states that cooperatives also contribute to employment creation in the agricultural sector and other sectors of the economy. Cooperatives employ a significant number of labourers; create and improve income, enhance feasibility of business activities; and therefore, have an important potential to alleviate poverty, boost empowerment, and create employment. There is an assurance if a cooperative organisation is functioning well, at least two unemployed people are directly employed while several others are indirectly employed (Simelane, 2011). It is therefore evident that cooperatives play a vital role in agricultural development.

2.4.3 Poverty alleviation

Mwangi and Kariuki (2015) found that the adoption of improved agricultural technologies is a significant vehicle for poverty reduction in most of the developing countries. The adoption of these technologies has been linked to higher earnings and poverty reduction; improved nutritional status; lower staple food prices; increased employment opportunities, as well as earnings for landless labourers. Pienaar and Traub (2015); Ngemntu (2010); Pote (2008), and Mdlalose (2016) identified the potential of the smallholder sector in South Africa as a vehicle through which the objective of poverty alleviation and rural development can be realised. At the same time Cousins (2010) supports the view that small scale farmers can moderate the rural exodus, establish growth networks, and can expand the market for industrial goods.

Ngemntu (2010) maintains that the smallholder sector contributes to poverty alleviation by reducing food prices and creating employment. The smallholder sector is in a better position to create employment than large commercial farms, due to the labour-intensiveness of not using much machinery during production. If smallholder farmers have access to land, this in turn suggests that they will be able to produce food.

The smallholder sector is capable of reducing poverty in three ways, namely through increased farm income, increased food production, and job creation, according to Pote (2008). Increased food supply improves the potential of these producers (even if it reduces unit prices) and then also manages to provide consumers with more and a bigger variety of products, even at a lower price. Pote (2008) points out that 65% of poverty in South Africa occurs in rural areas. If the majority of rural people are involved in agricultural production, the development of the smallholder sector will increase the prospects for poverty reduction.

2.5 Constraints to smallholder agriculture

The literature review identifies various constraints to smallholder agriculture. These constraints are frequently affecting smallholder farmers in achieving their goals of becoming big commercial producers. Policymakers should improve the conditions of the sector by helping them accessing the credit system.

2.5.1 Institutional constraints

Institutions are defined according to Jariand Fraser (2009) as instructors of the game that simplify coordination or govern relationships between individuals or groups. Institutions are divided into two, namely formal and informal institutions. Institutional characteristics and their role in marketing and economic development include transaction costs, market information flows, and the institutional environment. It is for this reason that smallholder farmers in developing countries lack suitable market information. This results in high transaction costs and later a hindrance with regard to formal market participation. When smallholder farmers are faced with high transaction costs, they will either decide to end their participation in marketing or divert to other means of marketing, such as spot markets.

Smallholder farmers face difficulties in accessing formal markets. There is a need for policymakers to improve present smallholder credit systems to guarantee that a broader variety of smallholder farmers are able to have access to credit (Mwangi & Kariuki, 2015). The degree to which smallholder farmers participate in input and output markets partially decides their productivity and later earnings. Farmers generally use a wide variety of inputs in the production practices, these include seeds and fertilisers, land, labour, and credit. Developing countries, especially in Africa, are characterised by few smallholder farmers not having enough money to buy fertilisers due to high purchasing prices, unless they get financial assistance from financial sources such as government and banks (UNCTAD, 2015).

The smallholder sector faces constraints which include, among others, access to institutions that supply useful information regarding markets. The absence of adequate market information and knowledge on the important issue of how the market works, limits smallholder farmers' prospects to better their livelihood (Morojele, 2014). The United Nations Conference on Trade and Development (UNCTAD, 2015) indicates that in developing countries, particularly Africa, almost 1% of commercial loans goes to agriculture, with the majority of this to large-scale farmers. Moreover, formal financial institutions are unable to provide financial services to smallholder farmers due to a lack of title deed, unstable earnings, the risky nature of farming activities, and difficult and complicated procedure in assessing smallholder's capacity to pay back their loans.

Even if credit is accessible to these farmers, interest rates are frequently very high, resulting in the smallholder farmers' inability to honour the repayment terms.

2.5.2 Technical constraints

Technical constraints are frequently affected by the advanced technology. These constraints are closely associated with technological development (Jari & Fraser, 2009). Smallholder farmers in developing countries lack proper transport facilities, road infrastructure, communication links, and storage infrastructure. Furthermore, a lack of these facilities normally challenges farmers' supply answers to any incentives in both agricultural production and marketing.

Thus, poor roads and poor telecommunication networks contribute to high transaction cost. At times these costs are too high for farmers to get any meaningful benefits from their transaction activities, thus discouraging them from marketing activities. Accessing information about new technology is a main determiner in technology adoption. However, this does not mean that it will be adopted by all farmers (Mwangi & Kariuki, 2015). The smallholder farmers can only adopt the technology that they are aware of or have heard about. A lack of access to extension services is also a key determinant in technology adoption. Therefore, these farmers should typically be informed by extension officers about the existence as well as the active use and advantages of new technology.

Ngemntu (2010) found that the extension officers regularly carry out a broad variety of activities to achieve technology transfer to the smallholder sector and are given limited opportunity to focus on production only. Loeper et al., (2016), discuss an example of extension officers in KwaZulu Natal who only visit smallholder farmers once a year. The fact that the level of education of these officers remains low is of concern for smallholder farmers.

2.5.3 Regulatory barriers

Regulations should be in place to safeguard consumers; however, in specific circumstances it can be a way to decrease competition within a certain industry. The

regulation can be there to protect the standard of the industry or to ensure customer confidence in the industry. The setting of standards refers to defining and establishing uniform specifications and characteristics for products and/or services

Even when suitable regulations have been well-defined, difficulties remain, since traders are not aware of the rules. What makes things worse is the weak enforcement of regulations, which permits dishonest traders to repackage and/or adulterate genuine products, resulting in poor quality and outdated products. Farmers then are uncertain about the make-up of the available products, for example, fertilisers (World Bank, 2011). This lack of standards becomes a main hindrance to cross-border trade and regional fertiliser markets. Previously, when the government played a bigger role in supplying inputs to farmers, there was little need for regulations. Currently, governments have permitted the private sector a role in supplying inputs; thus, the government has to take responsibility for designing and implementing standards that support the market. Numerous industries in South Africa are governed by regulatory bodies.

Product market regulation is an important for the well-functioning of market-based economies, particularly to ensure market honesty and thus to main maintain the general trust of customers and investors in the behaviour of private transactions. It is also essential to accomplish, inter alia, health and safety, and environmental goals. Policymakers should design regulations so that smallholder goals can be achieved in a way that enhances compliance costs for businesses, according to Economic Policy Reforms (EPR, 2014).

According to the Chicago Metropolitan Agency for Planning, not all regulations are negative. Various regulations benefit people, includes land usage regulations that prevent an industrial building from being established within a residential block and environmental regulations that prevent potential health difficulties, (CMAP, 2009). These kinds of regulations are recognised as regulatory barriers and are frequently exclusionary in nature; although, some analysts argue that productivity prices are principally determined by market demand and not growth challenges.

2.6 The history of irrigation development in South Africa

Between 1914 and 1916 the Cape Province suffered a drought that saw the first move from flood irrigation to conservation-based techniques. During the great depression in the 1930s, there was a substantial loss of jobs and money. These difficult circumstances resulted in white farmers migrating into towns in pursuit of employment opportunities. In an effort to overcome this problem and to address poverty, the government of that time decided to create a number of government irrigation economy schemes where white farmers could be settled. This saw the establishment of the Vaalharts, and the Loskop irrigation schemes which remain the two largest government irrigation schemes in the country (DAFF, 2012).

2.6.1 History of irrigation development – commercial sector

South Africa is a water scarce country due to its low average annual rainfall (less than 500mm), and the unevenness of surface and ground water distribution which is a consequence of climate change and geography (21% of the country receives less than 200mm). Only 8,6 percent of rainfall converts to useable runoff, the lowest proportion in the world. Commercial farmers produce high-value crops on irrigated land primarily for the export market (Ngigi, 2002). Perret (2002) outline that frequently, these farmers are extremely specialised in their use of technology such as drip sprinklers and even centre pivots.

Currently, South Africa has an estimated 1,3 million ha of land under irrigation for both commercial and smallholder agriculture. Irrigation was introduced to South Africa soon after the arrival of European settlers, although it was actually established from 1912 onwards. This emphasises the early gap that existed between white- and black-oriented irrigation policies. In the former homelands or native areas, minor irrigation development took place prior to 1950. Most irrigation schemes were started after the publication of the report from the so-called Tomlinson Commission on the socio-economic development of the homelands. This report and the implementation of some of its recommendations had a major effect on settlements, land use patterns and irrigation development in black rural areas. Its effects are still very noticeable today (Perret, 2002).

DAFF (2012) quotes the South African National Committee on irrigation and drainage (SANCID) that describes the three phases of irrigation development in the commercial sector. These comprise the following:

1) Phase 1 – Agriculture Phase

Up until 1875, the government did not offer any support for water resource development. Water abstraction happened where natural conditions allowed. This phase was characterised by a subsistence economy where markets were frequently a long distance away from where the agricultural crops were grown. There was little incentive for capital investment.

2) Phase 2 – Agricultural – Mining Phase

The Cape Colony was the first to initiate a policy in 1877. This was assumed to promote irrigation, utilising an approach of partnership among producers, combined with unsubsidised loans for individuals or cooperative dam diversion and flood irrigation. Originally the cooperative flood scheme growth was slow, but it rapidly gained momentum after 1906 with the demand for ostrich feathers, together with the cultivation of lucerne pastures that were grown under irrigation.

3) Phase 3 – Agriculture – Mining – Industrial Phase

This phase was characterised by the establishment of public storage schemes due to the unpredictable rains and the variable rainfall patterns that necessitated the storage of water. During this phase, only a few farmers participated in the irrigation schemes but subsequently more settlers were brought in, to encourage cooperative development. The crops that were targeted in this phase included tobacco, cotton, and citrus, among others. The financial approach was also revised where loans were written off with partial subsidisation of private and cooperative schemes, as well as the complete subsidised public schemes (DAFF, 2012).

2.6.2 History of smallholder irrigation schemes (SIS)

The water shortage triggered by low and unreliable rainfall and high evaporative demand restricts dryland crop production in most of South Africa. Irrigated agriculture

presents an attractive alternative under these circumstances. Van Averbeke et al., (2011) define irrigation as the artificial application of water to land for the purpose of increasing plant production. It decreases or eliminates water shortage as a limiting issue in plant development and makes it feasible to grow crops where the climate is too dry for this purpose and to raise crop harvests where plant-accessible soil water is a yield-limiting aspect during parts or throughout the production season. The term irrigation scheme is defined (Van Averbeke et al., 2011) as an agricultural development connecting numerous enterprises that depend on a shared delivery system for access to irrigation water, and in some cases, on a shared water storage or diversion facility.

During the 20th century, South African social policies of racial segregation and separation benefitted whites. Irrigation development was no exclusion and the lion's share of irrigation schemes was created for the settlement of white farmers. Furthermore, irrigated holdings of white farmers, which ranged between 8 ha and 20 ha, were on average about 10 times larger than the 15 ha plots allocated to black farmers. The comparatively small size of the irrigation plots assigned to black farmers describes why in South Africa, the term "smallholder irrigation scheme" is generally used to refer to irrigation schemes on which the land is held by black people (Van Averbeke et al., 2011 and Ledwaba, 2013).

In 2010, smallholder irrigation schemes covered 47667 ha, compared to the 1 675 822 ha of recorded irrigation land in 2008, of which 1 399 221 ha was irrigated annually. The entire population of 34 158 plot-holders on smallholder irrigation schemes in the same period was too small, given the 1,3 million black homesteads that had access to land for farming. The significance of smallholder schemes is mainly due to their locality in the former homelands, which continue to be poverty nodes (Cousins, 2013). In these areas, irrigated farming has the potential to contribute significantly to food security and income of participating homesteads, and to produce employment, both directly and through forward and backward linkages to principal production.

Smallholder irrigation schemes in most developing countries have been proven to be unsustainable without external support. The history of smallholder irrigation schemes shows that these irrigation schemes suffered substantial neglect and were a combination of success and failure during the post-independence era. Their

significance in the semi-arid regions cannot be over-emphasised (Mutambara & Munodawafa, 2014).

DAFF (2012) and Ledwaba (2013) distinguished four eras in the history of the development of smallholder irrigation schemes. These include the following:

a) 19th century: Peasant and mission diversion scheme era

Evidence shows that irrigation development was an innovation which originated after colonialism. This was the first era of smallholder irrigation development in South Africa, introduced during the 19th century. It was referred to as the peasant and mission diversion scheme era as it was associated with mission activity and the emergence of African peasantry. This era saw the development of river diversion technologies by private individuals or groups.

b) 1930 – 1960: The smallholder canal scheme era

Most of these canals were built after the Second World War and the main goal of this development was to offer black families in the Bantustans with a living. By 1955, it was estimated that about 122 small irrigation schemes were developed, covering 11406 ha. This included 7538 plots ranging from 1,28 to 1,71 ha, that were moderately small compared to the sizes of those established for white irrigation schemes which ranged from 8 to 20 ha.

The way in which the plots were assigned meant that less land was allocated to blacks than to whites. The majority of irrigation canal schemes of this period were established on the land that belonged to the state and farmers held their plots by means of permission to occupy (PTO), which empowered the state to prescribe the manner in which land could be utilised and to evict and replace those farmers who did not comply with state rules.

c) 1970 – 1990: The independent homeland era

During this era, all homelands were characterised by poverty, low growth, and a mostly rural resource base. The government of that time funded the growth of extra irrigation schemes in these homelands.

This era is the third period of irrigation development, which continued from 1970 until 1990. It was regarded a significant era in the economic development of the homelands. It was during the apartheid policy of post-World War II in which the people of South Africa were segregated by the establishment of independent homelands. Each homeland was meant to provide for a specific cultural or language group. In order to make the independent homelands system acceptable, it became necessary to develop the economy of each area.

d) 1990 – The irrigation management transfer (IMT) and revitalisation era

In this era, smallholder irrigation schemes were established to improve the lives of the formerly disadvantaged populations in the rural areas and in the formal homeland settlements. The emphasis was on poverty mitigation and food security at community level. Irrigation schemes covering 2400 ha were established with the key irrigation technology involving the use of mechanical pumps and sprinkler technology.

The IMT was initially followed through the Reconstruction and Development Programme (RDP) which concentrated further on food security at community or group level, favouring the formation of small schemes. When the majority of these smallholder irrigation schemes collapsed due to several reasons, the new South African government established a programme to revitalise the smallholder irrigation schemes in the late 1990s. During this period, the smallholder irrigation schemes comprised those situated in the former homelands and those that were positioned in commercial farming areas where white farmers were previously settled.

2.6.3 Smallholder irrigation farming in South Africa

About 63% of South Africa's water utilisation goes to agriculture-related activities as described by Moyo (2016). South Africa's smallholder sector uses the highest percentage of accessible water for personal use, as well as for irrigation purposes. The term smallholder irrigation, in the South African context, is used to describe irrigation farming performed by black farmers (Van Averbeke & Mohamed, 2006). The smallholder irrigation farmers are not homogenous. The smallholder irrigators were previously commonly categorised and distinguished according to how they manage more water provision for example supply and distribution infrastructure.

A study conducted in 2011 (Van Averbeke et al., 2011) reports that in 2010 there were only 302 smallholder irrigation structures with collective area of 47 667 ha in South Africa. The smallholder population on these structures totalled 34 158 and rivers were the primary source of water. An area of 46114 ha (96,7%) got water from rivers by either directly pumping it from the source, diverting it by means of dams, or dam storage. Ground water was utilised on 1 405,5 ha (3,0%), municipal water on 110 ha (0,2%), and spring water on 37,6 ha (0,1%). Water was pumped on 23111,8 ha (48,5%), gravitated on 16 497,2 ha (34,6%), and on 8 058,5 ha (16,9%) both gravity and pumping were used.

As mentioned before, South Africa has approximately 1,3 million ha under irrigation, of which 0,1 million ha is controlled by smallholders. Smallholder irrigators are divided into four groups, namely farmers on irrigation systems; independent irrigation farmers; communal gardeners; and home gardeners (Van Averbeke & Mohamed, 2006). The number of South African smallholder irrigators is estimated to be between 200 000 and 250 000, with most farming on small plots – mainly to provide food for home consumption.

DAFF (2016) provides a different estimation of the area under irrigation, stating that approximately 1,6 million ha is currently under irrigation where around 50 000 ha is situated in the former homelands and is allocated to smallholder farmers. South Africa covers 122081150 ha in total of which about 14 million ha (13%) is cultivated land. It is estimated that approximately 35% of the South African people are directly or indirectly dependent on agriculture for employment and income. The agricultural sector contributes approximately 2,0% to the Gross Domestic Product (GDP) and formal employment (DAFF, 2016). This sector is made up of commercial and smallholder farmers.

The agricultural potential in South African is limited, with above 60% of the country getting less than 500 mm of rain per year on average and with only 10% getting above 750 mm (Cousins, 2013). South Africa experiences unpredictable, common droughts, and crop production in most of the country is fundamentally risky, making irrigation a prerequisite for the production of a variety of field and tree crops. Previously, the distribution of irrigation water was as unfair as the allocation of land, with white commercial farmers holding rights to more than 90% of land. Regardless of significant

government investments in the formation and restoration of smallholder irrigation systems, some schemes encountered failure quickly after the withdrawal of government support. These failures occur despite the fact that South Africa embarked on a process to transfer the management of state-managed irrigation systems from government agencies to water consumers through IMT and PIM policies.

The Water Research Commission (WRC) noted that smallholder irrigation systems have not fared well in Africa (Van Averbeke et al., 2011). These schemes were generally poorly managed in terms of yields and economic revenues. The poor performance of smallholder irrigation schemes means that farmers cannot produce sufficient yields to cope with the demand for food. The persistent shortage of water makes it tremendously difficult to increase food production by raising the area under cultivation. Smallholder irrigation schemes have the potential to have an important local socio-economic effect through contribution to poverty relief and food security.

Smallholder farmers involved in irrigation schemes require support systems that go further than just the irrigation system to develop their livelihoods meaningfully. Smallholder irrigation farming is extremely complex with a mixture of social, agricultural, market and technical parameters, which are in a state of uncertainty and co-dependence (DAFF, 2012). Irrigation farming is a significant element of South African agricultural policy to increase the returns of the poorest groups in society through prospects for small-scale farmers. The Strategic Plan for South African Agriculture provides specific consideration to small-scale agriculture with three deliberate goals namely to make the sector more effective and internationally competitive, to support production, and to stimulate growth in the number of new small-scale farmers (Mudau, 2010).

2.7 Agricultural development and cooperatives

2.7.1 Definition of cooperatives

The International Co-operative Alliance (ICA, 1995); Simelane (2011); Ortmann and King (2007) and Raphela (2014) define a cooperative as “an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs

and aspirations through a jointly-owned and democratically-controlled enterprise". This definition suggests four things, namely that 1) cooperatives are established through groups of individuals who have identified mutual needs or challenges; 2) this organisation is created by members who have contributed to its assets; 3) the cooperative is formed and legitimately administered to accomplish anticipated goals; and 4) the organisation is a sovereign enterprise promoted, owned, and controlled by its members to meet their needs.

Agriculture for Impact (2017) defines a cooperative as an independent association of women and men, united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly-owned and democratically controlled enterprise. An agricultural cooperative is a prescribed system of farmer joint action for the marketing and processing of farm goods and/or for the acquisition and production of farm inputs.

There are seven universally documented cooperative principles, namely voluntary and open membership; democratic member control; member economic participation; autonomy and independence; provision of education, training, and information; cooperation among cooperatives; and concern for the community (Ortmann & King, 2007). Cooperatives are developed for three key reasons (all-interrelated), namely economic conditions (caused by war, depression, technology and government economic policy); farmer organisations (such as quality of their leadership, their motivation, and enthusiasm to promote cooperatives and power to influence public policy); and public policy (as determined by government interest, legislative initiative, and judicial interpretation).

2.7.2 The benefits of cooperatives

Agricultural cooperatives assist producers resolve shared challenges, for example, to acquire inputs most proficiently and market their outputs on more favourable terms. With access to market being one of the most difficult constraints, the role of cooperatives in assisting farmers to exercise economies of scale becomes increasingly significant. Having cooperatives means farmers can draw dealers and institutional

purchasers and increase their bargaining power. The cooperatives aid in eradicating poverty and creating food security (ICA, 2015 and DAFF, 2012).

Farmer cooperatives differ from other agribusinesses as they are owned and controlled by farmers, landowners, and growers and managed for the common benefit of their members (Vimeo, 2017). Cooperatives contribute to rural economies everywhere in the world and offer the best opportunity for a farmer to participate and compete in agricultural business. In Turkey (Polat, 2015) cooperatives are estimated to have created more than 500 000 jobs. Due to their significant contribution to the national economy in rural and urban areas, cooperatives are commonly acknowledged to be the driving power in the social economy.

2.7.3 Challenges of cooperatives for smallholder farmers

Because agriculture remains the key source of income and employment in rural areas, cooperative enterprises play an important role in providing jobs to rural communities. Regardless of numerous advantages of agricultural cooperatives, they still face various serious challenges predominantly in developing countries. Similar to others business types, cooperatives have economic forces, laws, and human relationships that contribute to the achievement or collapse of the business, but also have different essential boundaries.

Some of the challenges faced by cooperatives that were identified by the United States Department of Agriculture (USDA, 1990) include:

a) Production control – Agricultural excesses have plagued farmers from time to time since the Civil War, motivating cooperatives to introduce production controls. Farmers had an unpleasant experience, particularly during the product marketing activities in the 1920s and the Federal Farm Board period a decade later, when they could not control production to any considerable degree.

b) Price fixing – Cooperatives could not control prices because of their incapability to control production. Whereas cooperatives frequently might influence demand for the specific product they marketed through highlighting enhanced production, improved

merchandising, and negotiation, they were unable to significantly influence the total demand for farm products.

c) Middleman functions – It is impossible for cooperatives to take short-cuts to the marketing system or functions within the system.

d) Market power – Some cooperatives obtain the leadership and financial capabilities to deal efficiently with other firms in the market place. As for the lack of leadership, managerial capability, capital, or for other reasons, some cooperatives do not or cannot vertically integrate their processes, either individually or together with other cooperatives in united associations.

e) Influence on prices and services – Prices for farm goods increase and prices for provisions or services decline to varying degrees.

f) Member attention and support – Farmer members cannot continuously participate in yearly meetings, provide satisfactory capital, or completely support the cooperative with their support. A lack of commitment by members might significantly limit a cooperative's capacity to completely grow its potential for helping farmers.

Other challenges faced by agricultural cooperatives, among others, are: 1) the world's increasing population; stable decline in the number of farmers; 2) instability in product prices; climate change and supportable growth; and 3) elderly farm community (Polat, 2015). The greatest serious challenge is the need to obtain and sustain suitable equitable capital to assist financial development and provide increased working capital. The requirement to be profitable in order to finance much wanted assets and sustain a tough balance sheet is challenging agricultural cooperatives. Balancing or managing the trade-off while following the best principle of proportionality of equity investment with the vital requirement to provide more equity risk capital is also a constraint facing farmers (Barton et al., 2011).

The capability of the cooperative to pursue unions with investor-owned companies or with other cooperatives is also considered significant for cooperatives. The fact that agricultural cooperatives are governed by producer-members is the main challenge for cooperatives. The main governance challenge is to identify and recruit directors with the important mixture of skills (Farmdoc Project, 2011). One of the key challenges for agricultural cooperatives in developing countries is how to deal with the unavoidable

pressures of an organisation that is controlled by and works for the benefit of its members.

The capability to resolve the deceptive inconsistency among effectiveness and equity and to discover the right trade-off among a business orientation and the promise of social inclusion, are among the main characteristics that make the cooperatives unique. Some of the main challenges for the cooperative sector are how to adopt a more business-oriented vision without becoming part of the typical business (Murandian & Magnus, 2009). Gala (2013) noted that the cooperative sector enjoys strong legal support in the Iranian economy, but its contribution to economic growth has remained restricted due to a lack of resources. Cooperative bodies, particularly those associated with production components; largely suffer from a lack of capital, limiting their chances of being successful.

2.8 Smallholder farmers and agricultural commercialisation

2.8.1 Definition of commercialisation

Leavy & Poulton (2006) and Nwafor (2015) describe agricultural commercialisation as complex, with a lack of clarity regarding what it means giving rise to misconceptions, which makes it difficult to put policy into practice. This lack of clarity contributes to the varying meanings and emphasis provided by the literature. One view is that commercialisation fundamentally means promoting change to the advantage of bigger, potential role players and to the detriment of the smallholder sector. Definitions of commercialisation differ in focus and breadth, and affect its measurement according to Zhou et al., (2013). They describe commercialisation as growing the commodity output while other authors generally describe it as a shift from subsistence production towards market-oriented production.

Agricultural Policy Research in Africa (APRA) (2017) defines commercialisation as “a process by which agricultural enterprises and the agricultural sector as a whole rely increasingly on the market on the sale of produce and the acquisition of production inputs, such as labour”. Asuming-Brempong et al., (2013) define smallholder

commercialisation as the condition where farmers of small individual and family farms obtain bigger engagement with markets, either for inputs, output, or both.

Definition by Nepal and Thapa (2009) and Hagos and Geta (2016) describe agricultural commercialisation as the move from subsistence production to an increasingly complex production and consumption system based on the market. In addition to marketing of agricultural outputs, it entails product choice and input usage choices based on the values of profit maximisation (Jaleta et al., 2009). It might happen on the production or output side with increased market excess and the input side with increased usage of bought inputs (Kirui & Njiraini, 2013). A smallholder farm is assumed to be commercialised if it produces a significant quantity of cash crops, assigns an amount of its resources to marketable products, or trades a substantial quantity of its agricultural produce. Yet, the definition of commercialisation goes further than merely providing surplus products to markets.

Kirsten et al., (2012) view agricultural commercialisation as the process by which farmers increase their production by producing further output per unit of land and labour, producing bigger surpluses that may be sold in the market, and therefore increasing their market participation with a beneficial result of greater income and living standards. Numerous issues need to be addressed to bring about commercialisation. These include improving seed quality and animals' breeds and introducing better practices, fertilisers, and knowledge.

2.8.2 Conceptual model for agricultural commercialisation

The model by Zhou et al., (2013) clarifies the concept of commercialisation and provides an overview of the concept by providing a summary of the main elements of commercialisation and how they are interconnected. It highlights various characteristics, such as the various drivers, the two-sided nature of determinants, strategy options, measurement elements, and the many-sided nature of effects.

This provides completeness regarding planning, implementation, and evaluation of commercial agendas. The measurement components of the model may be utilised to outline smallholder farmers according to commercialisation level is involvements for different levels. Because of various agricultural growth cases globally, the model is

instrumental in investigating, understanding and evaluating the cases because it provides a framework to separate main issues and lessons from experiences.

The main elements of the model are highlighted in Figure 2.1. These are not limited to agricultural commercialisation projects alone and can be adapted for other developmental projects.

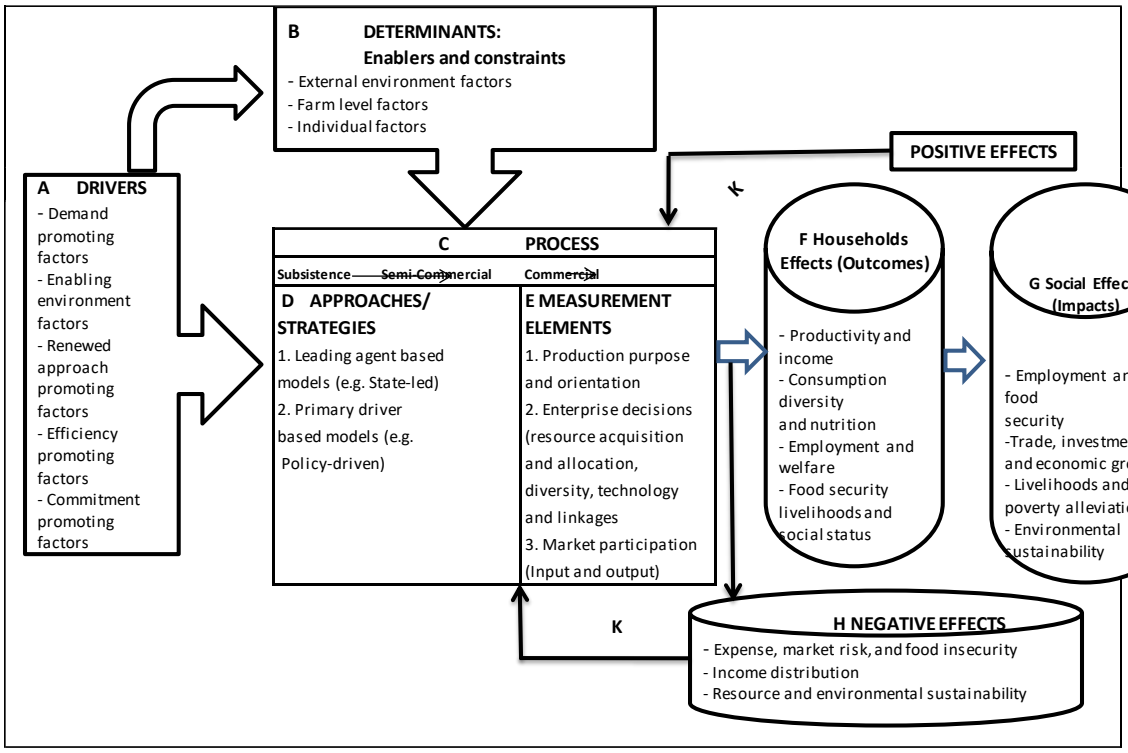


Figure 2:1: A conceptual framework for agricultural commercialisation

Source: Zhou et al., 2013

Figure 2.1 portrays various drivers including:

(a) Starting the process of commercialisation through various means, such as increased demand for produce, a conducive policy environment, the accessibility of resources, new approaches to farming, adequate technology for farming activities, and having more skilled entrepreneurs. If this occurs, the production for markets becomes essential and efficient. The smallholders' progression towards market orientation is affected by many factors, such as environmental and socio-economic aspects and individual determinants (Nwafor, 2015).

(b) The effects of these aspects are both favourable and unfavourable because they can either enable the process or cause it to fail.

(c) The process is approached differently, based on the leading means of change or the main drivers or any combination of these.

(d) The approach that is adopted will determine who the main role players are, their main activities, and the role of producers.

(e) The progress of transition from subsistence to commercialisation is measured or indicated by aspects such as purpose of production, allocation of resources, and market participation.

(f & g) The success of commercialisation is eventually likely to yield positive outcomes at household level and have positive impacts at societal level.

(h) At the same time, negative and unintended effects develop and the entire provide a feedback about the process.

2.8.3 Levels of commercialisation

Pingali and Rosegrant (1995 cited in Leavy & Poulton, 2007: 9) identified three levels of market orientation according to food production systems. These include subsistence systems, semi-commercial systems and commercial systems. They differ in terms of the farm households' objective for producing a certain crop, their source of inputs, their product mix and their income source. Table 2.1, adopted from Leavy and Poulton (2007:9), presents the three levels of orientation and the characteristics of the households belonging to each category.

Table 2.1: Levels of market orientation with increasing commercialisation

Level of market orientation	Farmers' objective	Sources of inputs	Product mix	Household income sources
Subsistence systems	Food self sufficiency	Household-generated (non-traded)	Wide range	Predominantly agriculture
Semi-commercial systems	Surplus generation	Mix of traded and non-traded inputs	Moderately specialised	Agricultural and non-agricultural
Commercial systems	Profit maximisation	Predominantly traded inputs	Highly specialised	Predominantly non-agricultural

Source: Pingali and Rosegrant, 1995 but adopted from Leavy and Poulton, 2007

As simplistic as it is, this way of categorising the market orientation of farm households may not be applicable in many developing countries. However, it is similar to the food production system of smallholder dominated countries of Africa and Sub-east Asia. Table 2.1 is simplified and contains several significant dynamics about agricultural commercialisation. Those whose departure is agriculture in general – either because they concentrate on non-farm activities, migrate from rural areas altogether, or end up mostly as providers of wage labour to remaining farms – might be in the minority at early stages of rural growth, but grow to become the majority as both agricultural commercialisation and broader economic development proceed.

2.8.4 The benefits of agricultural commercialisation

The benefits of commercialisation are multifaceted. Commercialisation plays an important role in increasing incomes and stimulating rural growth, as highlighted by Von Braun and Kennedy (1994 cited in Leavy & Poulton, 2007: 2), through improving employment opportunities; increasing agricultural rural productivity; direct income benefits for employees and employers; expanding food supply, and potentially improving nutritional status.

In most cases, these increased incomes have led to increased food consumption (Bouis 1994 cited in Pender & Dawit, 2007) and improved nutrition (Kennedy 1994 cited in Pender & Dawit, 2007). Others look at the benefits of commercialisation from the context of comparative advantage. Govereh et al., (1999) noted that commercialisation increases productivity and income. The basic assumption embedded in the comparative advantage is that farmers produce mainly high-value cash crops, which provide them with high returns to land and labour and buy household consumption items using the cash they have earned from cash crop sales (Govereh et al., 1999). However, Govereh et al., (1999) caution that the previous assumption cannot work if the market for non-cash crops is inhibited by risks and high costs in the food marketing system.

Timmer (1997) is of the opinion that smallholder agricultural commercialisation is significantly related to “higher productivity, greater specialisation, and higher incomes” (cited in Bernard et al., 2007). Timmer (1997) and Fafchamps (2005, cited in Bernard et al., 2007) further stated that the aforementioned outcomes give way to improvement in food security, poverty reduction, and economy-wide growth (Bernard & Spielman, 2008: 1).

Most scholars noted that the outcomes of commercialisation are largely dependent on whether efficient markets exist or not. If efficient markets exist, commercialisation leads to separation of production from consumption, supporting food diversity and overall stability at household level (Bernard et al., 2007: 1), and increased food security and improved allocative efficiency at macro level (Timmer 1997; Fafchamps, 2005, cited in Bernard et al., 2007). However, if markets remain inefficient, entailing high transaction costs, the smallholders will fail to exploit the advantages of commercialisation.

According to Gebreselassie and Sharp (2007:67), agricultural commercialisation is way for smallholder farmers to achieve welfare objectives. They explain farm household as the consumption of basic food (grains), high-value foods (livestock products), and expenditure on clothes and shoes, durable goods, education, and healthcare. The increased engagement in productivity markets would result in higher agricultural output, which is a transitional result rather than a welfare objective. However, agricultural output may facilitate the achievement of the welfare objectives of the smallholder sector.

2.8.5 Factors affecting potential success of commercialisation of smallholder farming

Commercialisation of smallholder farming, as highlighted by Abera (2009) may accomplish its goals and bring about the needed benefits to the poor and rural households when particular aspects affecting its potential achievement or those that influence a farm household's decision to participate in the market are addressed. Von Braun et al., (1994: 13-14) identify several external factors that determine commercialisation, namely population change, availability of new technologies, infrastructure and market creation, and macro-economic and trade policy are considered to be among the most important driving forces.

Leavy and Poulton (2007: 12) identified three critical conditions that need to be in place if agricultural commercialisation is to be a success. The first relates to staple foods and asset accumulation. Market access can be achieved in many ways. Many organisations, such as the Department of International Development (DFID), the US Agency for International Development (USAID), the African Development Bank (ADB), and the Swedish International Development Agency (SIDA) (which advocate the "market for the poor" policy) believe that smallholder farmers can have better access to the market as a consequence of "agricultural growth" and better infrastructural developments (Leavy & Poulton, 2007: 12). "Market for the poor" initiatives also emphasise the need for better market information, stronger farmer organisations, and promotion of contract farming as a component of the effort to help farmers access the market.

The second critical condition for viability of agricultural commercialisation identified by Leavy and Poulton (2007) is access to food markets and food production.

There are two contrasting views with regard to whether smallholders should focus on food crop or cash crop production. There are those who disagree with the claims suggesting that small farms should produce and sell high valued cash crops and buy food crops from the market with the income from the cash crops. They argue that such a venture has a high risk of food insecurity and price variations given the imperfections of rural food markets in Africa. Therefore, smallholder priorities for subsistence farming

are considered to be rational even if these farmers could have earned better incomes by diversifying into cash crop production.

On the other hand, there are those who argue that farm households producing cash crops to the market would mostly integrate food crops in their production system. Thus, they are less susceptible to food insecurity; rather, they get higher yields in their food crop production than the purely subsistence-based households (Von Braun and Kennedy, 1994 cited in Leavy & Poulton, 2007).

The third critical factor in the pursuit of commercialisation, according to Leavy and Poulton (2007), is asset accumulation. In particular, this refers to land and animal traction (livestock plus equipment). Land is obviously one critical factor that determines the chance of participation of a farm household in commercialisation. In a study covering five African countries, Jayne et al., (2003 cited in Leavy & Poulton, 2007) found that poor households are less responsive to market opportunities as a consequence of a lack of land, capital, and education. Moreover, they found that per capita income of households generally increases incrementally according to land holding size.

Leavy and Poulton (2007) argue that farmers with small land holdings are forced to use the largest portion of their land for food crop production given the poor food crop markets they are dependent on. Jayne et al., (2003 cited in Leavy and Poulton, 2007) suggest that a strong system must be in place to provide technical advice; supply improved seeds and high-value crops; as well as fertiliser to the poor at an affordable rate; and to create an improved linkage to the market for higher-value crops if the effort to intensify and commercialise small-sized farms is to be successful (Jayne et al., 2003 cited in Leavy & Poulton, 2007).

Another form of asset accumulation is animal traction. According to Leavy and Poulton (2007: 21), accumulation of animal traction can benefit farmers in two ways, by increasing their responsiveness to rainfall and through provision of manure. Quick response to rainfall results in higher yields as is the case with the use of manures which enhances soil fertility and thus the yields of the farm household.

Pender and Dawit (2007) have developed a long list of factors that affect commercialisation at local level, based on the findings of different researchers (Pender

et al., 2006). Similarly, commercialisation is affected by climatic conditions and risks; access to market and infrastructure; community and household resources and endowments; development of local commodity, input, and factor markets; laws and institutions; and cultural and social factors affecting consumption preference, production, and market opportunities and constraints.

From a different perspective, Mahelet (2007) assessed the literature and found several factors that can either facilitate or constrain the commercialisation of smallholder farming in the context of developing countries in general. These include, among others, distance to the market, transport and road access; availability of credit, extension services and market information; output, input, and factor prices; land size, access to modern inputs and storage facilities; and integration into the output market.

2.8.6 Determinants of agricultural commercialisation

The majority of people in developing countries live in rural areas and are mostly reliant on subsistence agriculture to make their living. Transformation of agricultural farming through commercialisation is viewed as the most feasible method of addressing the prevalent high levels of rural poverty and food insecurity. Nevertheless, in spite of years of promoting the agricultural market which led to growth approaches like commercialisation, very few smallholder farmers in Sub-Saharan Africa participate in product markets as sellers. However, researchers and agriculturists agree that agricultural sectors in developing countries need to evolve from low productivity semi-subsistence farming to highly commercialised production systems (Muricho, 2015). Therefore, the potential of commercialisation as a means to rapid agricultural development and eradication of extreme poverty, particularly for the poorest of the poor in rural areas of developing countries, remains immense.

Commercialisation approaches or strategies can be grouped according to the primary driving force or leading change agent. Efforts at commercialisation can be dominated by one agent or extra entities undertaking facilitation or operating roles. The approach might be led by the state, private sector, donors, or a collective or partnership approach. Such a partnership may combine the efforts of the state, the private sector, and/or donor agencies. Zhou et al., (2013: 5) noted that of all the commercialisation

strategies, partnerships have proven to be the most successful, “as single agent strategies attested costly or unsustainable’’. On the other hand, a leading driving force for the commercialisation process could be policy, demand, technology, entrepreneurship, or value-chain driven and it might be driven by a grouping of these forces (Zhou et al., 2013).

Some studies, for example, as discussed by Nivievskyi et al., (2010), group the determinants of agricultural commercialisation and specialisation extensively into external and internal drivers (Jaleta et al., 2009 and Nwafor, 2015). The forces considered to be outside the household’s control, are population growth and demographic change, technological change and the introduction of new commodities, development of infrastructure and market institutions, development of the non-farm sector and the broader economy, increasing labour opportunity prices, and macro-economic, trade and sectoral policies that affect prices and other driving forces (Pingali & Rosegrant, 1995). Factors such as smallholder resource endowments, for example, land and natural capital, labour, physical capital, and human capital, etc., are household-specific and are seen as internal determinants.

The level of the market is considered one of the main external issues of commercialisation and specialisation. Urbanisation and higher incomes from economic development increase the demand for marketed agricultural products, which will tend to increase product prices and stimulate specialisation and agricultural production for the market.

Other external factors include the development of input and output markets, property rights and land tenure institutions, market regulations, cultural and social aspects affecting consumption preferences, production and market opportunities and constraints, and agroclimatic conditions such as market and production risks (Jaleta et al., 2009).

There are a number of determinants in commercialising smallholder agriculture according to Jaleta et al., (2009) and Zhou et al., (2013). These factors are classified according to the nature of their impact, for example:

a) Population growth and demographic change

These are considered the demand-side driving forces for smallholder commercialisation subsequent to the urbanisation effect of economic growth (Von Braun et al., 1994). Urbanisation and higher income from economic development increase demand for marketed agricultural goods which will tend to increase product prices and stimulate agricultural production for the market. Nevertheless, the increasing pressure on farmland by population development might delay the commercialisation process as food self-sufficiency on smaller pieces of land becomes more important than producing for markets. Furthermore, population pressures might result in land degradation and lower output. Thus, the direction of the influence of population development on commercialisation might be uncertain (Jaleta et al., 2009).

b) Technologies

The significance of resource-saving and yield-enhancing technological innovations and their implementation by the smallholder farmers is unquestionable in the commercialisation process (Von Braun et al., 1994). Adopting a short-run focus, increased commercialisation can take place without change in agricultural technologies, but the opposite would be less likely due to the indispensable demand-side pull for technological innovation (Von Braun et al., 1994 and Jaleta et al., 2009).

c) Institutions

North, (1990) and Jaleta et al., (2009:18e) define institutions as “rules of the game” consisting of both formal rules (laws, constitutions, property rights etc.) and informal constraints such as norms, conventions, and codes of conduct that provide the structure for human interactions. With their influence on human behaviour, institutions affect economic performance, development, and growth. In order to understand the significant role of institutions in smallholder commercialisation; it is vital to separate and briefly describe institutional environments and institutional arrangements. Institutional environments, according to Jaleta et al., (2009), refer to the important political, social, and legal ground rules that establish the foundation for production, exchange, and distribution. For

example, rules governing property rights and the right to contract fall in this category. On the other hand, institutional arrangements refer to the relations among economic units that define how these units can cooperate or compete.

d) Risks

Production is market-related; and risk has a direct effect on farm household decision-making performance (Finkelshtain & Chalfant, 1991). Although production risks are assumed to be the same for both subsistence and marketed goods, major risks to smallholder commercialisation typically arise from market and policy failures. In many rural economies, land, labour, financial, and insurance markets are either non-existent or imperfect.

Under such circumstances, risk-averse semi-subsistence households tend to produce further of the “market-risky” subsistence goods (consumption commodities). This situation particularly applies when the effects of shocks are trigger changes in household consumption more than in income (Von Braun et al., 1994).

e) Markets and their integration

The existence of low-cost, well-integrated, and effective rural markets is an important component in agricultural commercialisation. Resource allocation to marketed crops decreases significantly in the absence of food markets; as food self-sufficiency at household-level takes prominence (De Janvry et al., 1991).

Explaining the significance of well-integrated markets for household market participation and enhanced returns from technology acceptance, Barrett (2008) argues that well-integrated markets transfer surplus supply to distant locations. For this reason, the returns to increased output due to technology adoption diminish less rapidly in well-integrated markets than in segmented or poorly integrated markets. The potential for negative welfare effects on non-adopters due to a decline in output prices is also lower in well-integrated markets.

f) Transaction costs

Key et al., (2000) divide transaction costs into two types, namely fixed and proportional transaction costs. Searching, monitoring, and screening are examples

of fixed transaction costs. This category of transaction cost is highly household or commodity-specific, non-variant with the volume of transaction and essentially discourages smallholder participation in markets.

Apart from its direct impact in deterring or limiting household participation in cash crop markets, the prevalence of higher market transaction costs also limits the household's involvement in cash crop production, by discouraging participation in food markets and prompting these farmers to give priority to subsistence food production (Pingali et al., 2005).

g) Food habits

Combined with small farm sizes and unreliable food markets that describe smallholders and the rural markets they operate in, food habits might be a motive for farmers not to commercialise according to Pender et al., (2006). Even if markets exist for some of the food products, the preference to consume own production is occasionally observed as a reason for self-sufficiency.

h) Asset holdings

Household asset holdings both in terms of both capital and a buffer to moderate any production and market-related shocks and are significant in a smallholder commercialisation process. The principle argument for household asset holding as a deciding factor in smallholder commercialisation is based on the consumption-side perspective by highlighting its role in mitigating unforeseen shocks in the commercialisation process.

The World Bank (2007) agrees that household asset holding in the form of human capital is one of the vital elements in commercialising smallholder agriculture. Human capital includes, the education, experience, skills, and capabilities of the household members engaged in pursuing new opportunities that could change the household's overall living standards.

i) Policy aspects

Pingali and Rosegrant (1995) emphasise the significance of appropriate government policies to facilitate the smooth transition from subsistence to

commercialised agriculture. This is essential because the process of commercialisation cannot be left to the market alone (Von Braun, 1994).

2.8.7 Constraints to the commercialisation of smallholder farmers

Various factors impede the successful participation of smallholder farmers in commercialised agricultural markets and the transformation of traditional farming systems into commercialised agriculture. Kirsten et al., (2012) categorise these are in five main areas:

1) Socio-economic characteristics of smallholder producers

Sub-Saharan Africa farming is characterised by subsistence farmers who have small plots of land (less than 0,5 ha per household) which they cultivate continually using rain-fed farming with little or no irrigation system in place (Jayne et al., 2011). In addition, these farmers often use recycle seeds they use in previous year, while having very little crop nutrients for eating purposes. However, smallholder farmers are frequently faced with difficult agroclimatic and political conditions. These constraints lead to low productive farming which is made worse by low and declining soil fertility, pest and disease outbreaks, and land degradation. Evidence by Kirsten et al., (2012) demonstrates that the socio-economic characteristics of smallholder farmers are a significant deterrent to the success of commercialisation (Ferris et al., 2014), because land permits the farmers to cultivate more than is needed for household consumption.

2) A lack of access to sufficient agricultural support services

The provision of support services remains one of the major significant interventions in the agricultural sector for commercialisation, food security and poverty alleviation for smallholder farmers. The commercialisation of the smallholder sector cannot be accomplished without suitable agricultural support services (Poole et al., 2013). With adequate access to farmer support services, these farmers can contribute to increased agricultural growth, rural development and have a positive impact on the farm income (Khapayi & Celliers, 2016). Farmers in Sub-Saharan Africa living below the poverty line are characterised by low physical and natural resources, poor technical skills, and low managerial capacity as well as inadequate access to markets and infrastructure. Due to

these constraints, thus, public agricultural support systems are important in order to make it possible for smallholder farmers to attempt to enter productive agricultural commercial markets.

3) Transaction costs and other institutional factors

Institutional factors further contribute to hampering the full and sustainable participation of smallholder agriculture in commercialisation. These costs are a significant deterrent in the process of information searching, contract negotiation, monitoring and enforcement, and contribute to the expense associated with transporting goods to markets (Kirsten et al., 2012).

4) Insufficient and/or missing infrastructure

The literature identified insufficient or absent infrastructure as the main deterrent to the success of commercialisation or participation of smallholder farmers in high-value agricultural markets in developing countries, according to Kirsten et al., (2012). In some instances, farmers' efforts to either increase their production capability or attempts to participate in profitable markets are rendered unsuccessful by the lack of infrastructure such as irrigation systems and water resources, electricity or power sources, animal dip tanks and road networks. In instances where farmers are successful in becoming market-oriented in terms of their productivity, the physical isolation or remoteness and a lack of telecommunication infrastructure inhibits them from responding to higher market prices.

5) Effect of climate change-induced risks and uncertainty

Smallholder farmers are affected by climate change through weather conditions such as droughts and floods that directly affect agricultural production and market surplus. The study conducted by Kirsten et al., (2012) discusses climate change-induced effects on agricultural households, such as rapid outbreak and spread of crop and livestock diseases, increased incidence of human diseases, increased incidence of crop and livestock pests, and changes in seasons as the onset and quantity of rainfall become variable.

2.9 Agriculture and economic development

2.9.1 Views on the role of agriculture in economic development

Greyling (2012) argues that at the beginning of the industrial revolution, there was no formal theory regarding the role of agriculture in economic development as there had been no development except for in agriculture. It is estimated that at start of the 19th century, approximately 75 to 90% of the working population in the current developed world was still engaged in agriculture. Johnson (1997) noted that in the United States the urban population exceeded 10% of the total population only by 1830. The role of agricultural farming was discussed by Smith in the 18th century (1776: 140).

The development of towns and cities only became viable after land and labour production grew adequately for families to be able to produce more than they themselves could consume (Johnson, 1997). Nurkse (1961) observed that similarly, agricultural productivity in the United Kingdom developed significantly in the mid-19th century due to the humble parsnip, which permitted rotational production practices.

Timmer (2002: 1511) notes that during the 20th century, economists in the developed world turned their attention to the question of how to repeat this economic growth in the less-developed countries. Some classical economists regarded agricultural farming as “the home of traditional people, ways and living standards” (Timmer, 2002: 1511). The agricultural sector was viewed by economists (Hazell & Thurlow, 2007) as an outdated sector with low output, which can only contribute inactively to economic development through the provision of food, labour, and capital to the rest of the economy.

According to Timmer (2002:1511), agriculture was thought to provide the only basis of output which could be selected rapidly to fuel the drive for modernisation, which took place in cities and factories. The contribution of agriculture to economic development has remained an ongoing topic of debate among development economists (Awokuse, 2008 and Poonyth et al., 2001). Much has been written regarding the role of agriculture in promoting economic development in low-income countries after colonial rule. Awokuse (2008) found that many while many researchers held the view that agricultural development is a prerequisite to industrialisation and economic development, others

strongly disagree. Schultz (1964) argues that the development of the general economy depends on the growth of the agricultural sector.

Schultz (1964) and Timmer (2002), advocates of agriculture-led growth (ALG), oppose the investment in agriculture and the accompanying creation of infrastructure and institutions in other sectors as a prerequisite for national economic development. Studies conducted by Greyling (2012) acknowledge the role played by agriculture in economic development and growth through five inter-sectoral relationships, which include:

(a) Releasing labour for industrial sector;

(b) Supply of food and fibre for domestic consumption;

(c) Provision of market for industrial output;

(d) Increasing the supply of domestic savings; and

(e) Earning foreign exchange through agricultural exports.

In addition to these five direct market-based relationships; Timmer (1997) highlights the significance of direct non-market connections that enhance the quality of the major production factors, such as labour and capital. Agriculture indirectly contributes to economic development through the provision of better nutrient intake by the poor, food accessibility, food price stability and poverty alleviation.

Increased food production can help to meet the increasing needs of populations. Poonyth et al., (2001) discuss how the increase in agricultural output can release labour for industrial employment. They are of the opinion that high income, generated by the agricultural sector, can increase the demand for domestic manufactured goods, increase savings, and eventually generate increased capital investment in the industrial sector.

The evidence brought by Abera (2009) shows that the agricultural sector has remained an important role player in the development of countries for centuries. The World Bank (2009), in its 2008 Report for the World Development, stated that agriculture can “produce faster growth, reduce poverty, and sustain the environment” if it is made to work in concert with other sectors of the economy. The report specifies three methods

by which agriculture contributes to the economic development of countries, namely a) as an economic activity; b) as a livelihood; and c) as a provider of environmental services. Agriculture as an economic activity benefits the rural poor in achieving food security as the majority of these disadvantaged communities derive their income from agricultural output.

Hence, this contribution becomes crucial, particularly in Sub-Saharan Africa where many people experience extremely variable domestic productivity with inadequate tradability of food staples, as well as foreign exchange constraints. As a source of livelihood, the agriculture sector accommodates approximately 86% of the rural poor. Almost half of the world's population live in rural areas and the number of people relying on agriculture and smallholder households is nearly 1,5 billion.

A surprising decrease in the poverty level in developing nations from 28 to 22% was noted in 2002. This was primarily attributed to decrease in poverty levels in rural areas. 80% of this decline in rural areas is attributed to improved conditions in rural areas. Besides the negative environmental consequences, such as groundwater depletion, soil exhaustion, and agrochemical change, associated with the sector; it has been acknowledged that agriculture can positively affect the environment by sequestering carbon, managing watersheds, and preserving biodiversity (World Bank, 2007).

Hazell et al., (2007:6) "several authors are convinced that fast development in agriculture is crucial for African countries to achieve the Millennium Development Goals". Hazel et al. (2007:6b) further states that "farming has a high potential to create jobs, to increase returns to the asset that the poor possess – their labour and in some cases their land, and to push down the price of food staples". Several authors are convinced that fast development in agriculture is crucial for African countries to achieve the Millennium Development Goals (MDGs). The Millennium Development Project's Hunger Task Force decided in 2005 that "the world could meet the MDG of halving hunger by 2015", and that "development of agriculture is critical to that goal" (World Bank, 2007). The important role of smallholder agriculture in poverty reduction and economic growth is evident in light of the present reality of 1,5 billion farm households living in rural areas of the developing world.

The role of agriculture in economic development and identifying ways in which this role can be improved have been typical themes in development economics (Mellor, 1966).

This is more specifically for nations that need to industrialise agriculture and is generally the main source of income that can be used for investment by smallholder activities. The accomplishment of successful agricultural and rural development depends predominantly on the improvement of production technology and institutional changes (Hayami & Ruttan, 1985).

2.9.2 Conflicting fortunes of agriculture in economic development

The potential contribution of agriculture to economic development has been a question of considerable debate among development economists. Whereas some argue that agricultural growth is a requirement for industrialisation, others strongly disagree (Awokuse, 2008). Despite extensive research indicating the theoretical association between agriculture and economic growth, the debate continues. The causal dynamics between agriculture and economic growth is an empirical question worthy of further investigation, according to Awokuse (2008).

Two conflicting opinions regarding the contribution of agriculture to economic development exist in the literature. Development economists are of the opinion that agriculture plays a significant role in the economic development of the country, emphasising that enhancing agricultural output is essential for a successful development approach (Poonyth et al., 2001). The first argument, by Lewis (1954) is that industrialisation relies on agricultural development and production with both industrial and agrarian revolutions usually occurring together. The second view, by Mellor (1966) is that agriculture plays a major role in the industrialisation and modernisation of a domestic economy due to interrelationships and the multiplier consequence between food supply, rural buying power, labour, and capital.

The presence of conflict affects people's economic incentives. Some sectors of activity flourish, while others suffer (Chauvin, 2009). Conflicts have been driven by economic differences, rather than similarities. The great revolutions of the 20th century were borne of economic differences and the realisation that a relatively small elite acquired most of the land while the majority of the struggling working-class shares a disproportionately small piece of land for survival.

2.9.3 Policy environments and agricultural development

The policy summarises key matters and advances detailed policy recommendations that, over a period, will increase the incentives and decrease the deterrents to an enhanced balance of increased production development and supportable resource usage in the food and agriculture system, Organisation for Economic Cooperation and Development (OECD, 2015).

The European Commission (EC, 2017) notes that the Common Agricultural Policy (CAP) has identified some important aspects that require action to safeguard the European Union's rural heritage. These include:

1) Biodiversity and the conservation and development of 'natural' farming and forestry systems, and traditional agricultural landscapes;
2) Water management and usage; and
3) Dealing with climate change.

The CAP ensures that its rules are compatible with environmental requirements and that CAP measures promote the development of agricultural practices preserving the environment and protecting the countryside. The policy encourages farmers to continue playing a positive role in the conservation of the country and the environment.

South Africa, as an international role player (DAFF, 2002), has committed to and signed a number of international agreements regarding sustainable development and associated matters. The multilateral and developmental agreements mentioned below provide an outline for the implementation of supportable development. Some of the main United Nations multilateral, environmental, and developmental agreements that are either directly or indirectly related to agriculture include:

a) Earth Summit, Rio de Janeiro, 1992

In 1992, the leaders of the world's nations met at the Earth Summit in Rio de Janeiro to set out an ambitious agenda to address the environmental, economic, and social challenges facing the international community. The leaders agreed on a set of principles. These principles are included in what is now known as Agenda 21. Agenda 21 is an action plan and blueprint for sustainable development that

was one of five documents adopted by more than 178 governments at the United Nations Conference on Environment and Development (UNCED) in Rio.

The overarching message, as agreed by nations, is that development should be sustainable. Agenda 21 and the conventions and agreements reached at the Earth Summit in 1992 together form a global programme of action for sustainable development. Although being a global plan, the successful implementation of Agenda 21 is the responsibility of governments and therefore calls for nations to develop national strategies, plans, policies, and processes in order to strike a balance between social upliftment, economic prosperity, and environmental conservation. International cooperation should support and supplement such national efforts (DAFF, 2002).

b) Climate [United Nations Framework Convention on Climate Change (UNFCCC), New York, 9 May 1992]

Global climate change is probably the greatest environmental challenge facing the world this century. Although often referred to as ‘global warming’, global climate change is more about serious disruptions of the world weather and climate patterns, such as the impact on rainfall, extreme weather events, and a rising sea level, than just moderate temperature increases.

c) Biodiversity [Convention on Biological Diversity (CBD), Nairobi, 22 May1992]

The objectives of this convention are the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising from the utilisation of genetic resources.

d) Desertification [United Nations Convention to Combat Desertification (UNCCD), 17 June 1994]

As defined by the UNCCD, desertification means land degradation in arid, semi-arid, and dry sub-humid areas. This process can result from various factors, such as climatic variations and human activities.

e) Plant genetic resources [The International Treaty on Plant Genetic Resources for Food and Agriculture, 2001]

> The International Undertaking on Plant Genetic Resources for Food and Agriculture (PGRFA) is a comprehensive international agreement on plant genetic resources that provides the agricultural sector with a multilateral tool to ensure access to PGRFA, and to related knowledge, technologies, and internationally agreed funding.

Governments play an essential role in creating an enabling environment for agricultural development. Through the provision of the constant policy environment and avoiding erratic policy changes, poor regulatory transparency, weak contract enforcement, or restrictive investment policies, farmers (among other stakeholders) can be supported to engage in trading activities productively and beneficially (Agriculture for Impact, 2017). A supportive environment relies not only on the existence of laws and regulations, but also on their implementation in agriculture, consequently this will need strong political backing for the sector at the highest levels.

2.9.4 Lessons in agricultural development for rural agrarian economies

The contribution of small-scale farming to household-level food security in South Africa is primarily measured based on localised surveys and case-study evidence (Aliber et al., 2006). This evidence supports the notion that small-scale farming entails smallholder production which contributes to household nutrition in particular and household food security in general. Agriculture-related activities contribute positively to household nutrition which means that having effective programmes for improving agricultural output in the less-developed parts of South Africa can potentially have a positive impact on household and child nutritional status.

The contribution of agricultural development to the overall economic development is frequently overlooked, which means that the role that agriculture plays in rural economies is often underrated. Diao (2010) questions the cost of growth acceleration in Africa based on his findings that the green revolution in Asian countries frequently required enormous public investment. Agricultural development has played a significant role in poverty reduction, allowing several African countries to achieve the Millennium Development Goals of the 1990s of halving the poverty rate, earlier than the target date of 2015 (Diao, 2010).

Rural development allows rural communities to take ownership of their prosperity, thus dealing efficiently with rural poverty through the best use and management of natural resources. This is a participation process in which rural people study, over a period, their own practices and learn how to adapt their traditional learnings to their changing world. Rural development may be accomplished through self-help initiatives, coordinated and integrated broad-based agrarian transformation; supported by strategic investment in economic and social infrastructure that benefits entire rural communities. (Department of Rural Development and Land Reform, (2006).

2.10 The human dimensions in smallholder agriculture

The role of human dimensions in the rural developing nations is a concern (Kibirige, 2013) for the increased agricultural production as well as smallholder agricultural commercialisation.

2.10.1 The role of human dimensions

The human dimension is increasingly recognised by countries as a significant element that needs to be acknowledged and incorporated in daily decision-making (Bath, 1995). People choose the principles and uses of natural resources; hence the study of human dimensions seeks to understand how people decide, and what the outcomes of those decisions are in terms of sustainable production and profitability (Arizona Board of Regents, 2018).

Roe (2011) defines human dimensions as the social attitudes, processes, and behaviours related to maintaining, protecting, enhancing, and using improved productivity – particularly in rural development and economic growth. Currently, human dimensions examine how the “science of human systems” or theory-based social science can assist in economic growth and rural development. Of particular significance is understanding both individual decision-making as it relates the preservation of natural resources as well as how broader scale factors, such as background, community, policy tools, and networks influence behaviour. The human dimensions according to Roe (2011) are characterised by:

1) The individual attitudes, knowledge, opinions, and behaviour of private landowners and other main role players as they relate to natural resource management;
2) Studying the network, at community level, in relation to natural resource conservation for agricultural growth; and
3) Identifying and studying the innovative policy alternatives for natural resource preservation for sustainable growth in rural development.

A study conducted by HDgov (USA Government, 2002) on human dimensions examined how and why humans value natural resources for economic growth – especially for rural poor people, how humans want resources to be managed, and how humans affect or are affected by natural resource management decisions. Human dimensions investigations attempt to understand human characteristics and how to incorporate that understanding into management planning and activities.

The definition of human dimensions, for the purpose of this study, to clarify its role in the management of natural resources for agricultural purposes, includes motives affecting people's decisions; human behaviours, which lead to change; the effect of change on natural resources and quality of life; and management approaches to address change in the environment.

Natural resource management and climate change are the fundamental drivers of human behaviour. These forces play a significant role in people's decision-making processes, their activities, their impressions of the personal and social benefits and impacts of human activities, and their acceptance of change and control with regard to the social and natural environment. These driving forces include psychological; social; spiritual; cultural; economic; political; legal; and managerial factors (USA Government, 2002).

The human dimension is the main factor in agricultural development due to its significance in the farm decision-making. Several agricultural programmes utilise a top-down decision-making approach in most rural agricultural communities, excluding rural farmers from becoming involved in decision-making for intended objectives. Neglecting to involve farmers in the decision-making process limits the effectiveness of enhanced farm-household productivity (Steyn, 1982).

2.10.2 Human capital and agricultural productivity

Several studies regarding human capital and agricultural productivity have been done across the world. For example, Pinckney (1994) contends that the production development in agriculture is the solution to promoting an extensive increase in income and economic development in Sub-Saharan Africa. The growth can only be achieved through expansion of experience, as well as the development of educational and training opportunities because they play a significant role for African governments. Education is seen as an investment in human capital for agricultural growth.

Huffman (2002) agrees that education plays a significant role in the growth of human capital. Formal education or general intellectual accomplishment is obtained primarily in elementary and secondary schools as well as in colleges and universities. Studies conducted on human capital, demonstrate the significance of human capital for increased production and efficient use of agricultural resources. Well-trained farmers have proven to be early adopters of new technologies and more efficiently productive than their counterparts (Ogundari & Ojoo, 2005; and Tjornhom, 2006). The importance of education and experience in agriculture (Ndour, 2017) is discussed in more detail in Chapter 4.

The success of any country depends on the capability of farmers to take ownership of reforms and innovations. However, the level of human capital is significant in terms of the demands of modern and well-organised agriculture. As mentioned by the World Bank (2009), the low level of human capital in the African agricultural sector remains the main barrier to economic growth, poverty reduction, and food security (Ndour, 2017). The low level of output in the country in general, and in the agricultural sector in particular, also demonstrates that human capital investments should be enhanced to introduce new technology and should be complemented by investing in human capital. The adoption of new technology and its eventual distribution relies, in essence, on higher education and its complementarity with other levels of education (Lanzona, 2013).

According to Albers (2013) the role of human capital to increase the output and labour productivity in agriculture in Germany has not been taken seriously, even although it is of particular hypothetical significance compared to other sectors of the economy.

Human capital is the stock of skills and productive knowledge embodied in people (Albers, 2013: 10). Human capital is considered – by farmers, extension officers or agents, and researchers specialising in the growth and distribution of improved technology – to be fundamental to the accomplishment of productivity change in the agricultural sector. Over the past decades, many studies have been conducted regarding the role of human capital in the agricultural sector (Evenson, 1988). One such study, by Evenson (1988), illustrates that the human capital related to formal education enabled farmers to be more productive.

The concept of human capital was introduced by neoclassical economists, such as Schultz (1961) and Becker (1964). In their publications, they identified educated, trained and healthy workers, as the most essential component of human capital, which permits well-organised utilisation of the natural, physical, and financial resources. The enhanced quality of human capital provides economic profits to individuals by increasing both the employment rate and labour income. Human capital is of great importance in countries where the share of agriculture in gross domestic products remains high. It has the ability to increase agricultural productivity and enhance the total economic growth through “diverted and indirect links” (Timmer, 2002).

2.10.3 Social capital, rural development, and agriculture

Social capital is normally instituted where there is a structure of social associations among role players in the system of obligations and prospects; information and knowledge dispersed and exchanged in social networks, with social norms and values enhancing the coordination and accomplishment of mutual, common activities among economic agents (Evans, 1996; and Pretty & Ward, 2001). Zuwarimwe (2009) defines social capital as “a product of relational connections and networks that facilitate coordination of members’ activities and efforts towards a common goal by being a conduit of useful information and knowledge needed by economic agents”. However, outcomes are not only limited to those that are beneficial as the use of social capital can also have negative results.

Evans (1996) seems to agree that social capital is involved, alongside the goods and services, as a desired outcome of public-private cooperation for rural development. The

creation of social capital proposes new types of complementarities and advanced ways of seeing traditional complementarities. The contribution of social capital is general and from a distance.

Social capital grants are considered critical to cooperation agricultural activities. Social capital, accumulating over long time (perhaps hundreds of years), is the crucial element in creating the "virtuous circle" in which civic engagement in turn fosters civic engagement. Others suggest that social capital is defined as "resources embedded in a social structure which are accessed and/or mobilised in purposive actions" (Lin, 2001: 41). Bouma et al., (2008) refer to social capital as an issue open to discussion; however, most analysts treat it as a characteristic of rural development. Putnam (1993), and Ishihara and Pascual (2009) define social capital in terms of trust, norms and networks that enable cooperative achievement. Social capital, according to Bodin & Crona (2008); Pisani and Franceschetti (2011), and Ishihara and Pascual (2009) has been criticised for lacking explanatory value, and numerous theories exist that vary principally in their interpretation of social capital as either an exogenous or an endogenous variable.

Scholars, such as Krishna (2002) and Berman (1997), differ from the view of Bodin and Crona (2008), arguing that social capital has some explanatory value but that other aspects contribute to institutional and collective action. In addition, they contend that the significance of social capital is not the only aspect affecting the accomplishment or failure of resource management in general, and for fisheries in particular. Social capital is the key determinant for rural development accomplishment (Pretty & Ward, 2001 and Sorensen, 2000). The literature illustrates that social capital is frequently suggested as having a beneficial outcome on the capability of individuals to establish themselves efficiently. (Bodin & Crona, 2008). Social capital is significant in natural resource management for agricultural purposes and is crucial for the implementation and maintenance of environmental conservation and management at community level.

Since the 1990s, the theory of social capital has gained increased attention in the literature regarding common pool resource (CPR) management and cooperative action, particularly in relative to supportable usage of natural resources and sustainable development (Ostrom, 2000 and Pretty & Ward, 2001). Social capital is associated with incentive mechanisms or institutional measures to control individuals' inclination to free-

ride where the provision of public goods is concerned. It is also generally viewed as the existence of networks among agents and the dense flow of information among them lower the transaction costs of creating collective action (Ishihara & Pascual, 2009; Putnam, 1993; and Ostrom, 2000). Pretty (2003) refers to social capital as a new term referring to the value of connectedness and trust among people, and it is a prerequisite for the sustainable management and development of natural resources for economic development.

Pisani and Franceschetti (2011), Coleman (1990), and Fukuyama (1995) argue that the concept has been a topic of political science and sociological discussion since the 1960s, and that only from the 1990s the social capital has become the subject of specific analysis by political scientists.

There are many and varied definitions of social capital. The most famous and also most contested, is the one offered by Putnam (1993:167) who defines it as “features of social organisation, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated actions”. In essence, the concept symbolises the nature and intensity of contribution by an individual and/or by small communities (family and groups of relatives) in numerous informal networks or in formal organisations.

The sociological approach distinguishes, among others, two key explanations of social capital. The first one focuses on social capital as “the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalised relationships of mutual acquaintance or recognition” (Bourdieu, 1986: 248). The second interpretation emphasises the public nature of social capital as not appropriable by individuals, criticising the premise of social relations realised only for the gain of individual benefits (Coleman, 1990). Putnam (1993:170) describes social capital as an attribute of the social structure in which a person is embedded. He contends that social capital is “is not the private property of any of the persons who benefit from it”. Social capital promotes access to resources and it also assumed to be produced by networks (Wiesinger, 2007).

2.11 Factors affecting the adoption of technology by smallholder farmers

Several studies demonstrate that the adoption of new technologies among smallholder farmers is affected by various aspects (Dadi, Burton & Ozanne, 2004). These aspects include the socio-economic characteristics of individual farmers, farm features, weather or climate, and risk deliberation. The farmer's age, gender, education, farming experience, as well as the level of household income, and access to credit are some of the socio-economic aspects that are believed to be influential in adopting new technologies.

The factors which affect the adoption of agricultural technologies relate to the farmer and farming as well as technology (Adesina et al., 2002). Age has been widely determined to be a socio-economic factor affecting adoption. According to Saha (2002), findings suggest that age affects the adoption of new technology. There is, however, disagreement among researchers regarding the degree to which age has an effect, with some authors arguing that it will depend on the individual farmer and technology involved (Staal et al., 2002).

As expected, farmers who are well educated have better capacity to process information and search for new technologies appropriate to their production constraints than their counterparts (Mariano et al., 2012 and Farid et al., 2015). The significance of extension services has been vastly documented in the adoption of modern technologies. Farmers' attendance of training sessions has a potential influence on the adoption of technology, and the participation by farmers in farming demonstrations, enables them to learn, understand, and apply new technologies in their own fields. Accessing these types of capacity enhancement extension services increases the prospects of new technology adoption.

The adoption of agricultural technologies is an important consideration in planning and implementing technology-associated programmes to meet the challenges of food production in developing countries (Obayelu et al., 2017; and Mwangi & Kariuki, 2015). However, the rate of adoption of these technologies has remained low in most developing countries. New agricultural technology embodies several important factors that may affect adoption decisions. Changes in technology adoption are associated with changes in the economic situation of the country, financial standing of farm households,

and the net achievement from adopting new technology, access to credit, access to information, travel cost, characteristics of the technology, scale of operation of the farmers, income, cultural norms and values, social network, and human specific factors.

Smollo et al., (2017) contends that the adoption of sustainable, modern farming technology is required to ensure food security and poverty alleviation, thus there is a need for increased agricultural production. Technology adoption is influenced by a number of factors, such as inputs and technicality of agronomic practices, government policies, soil quality, management practices, damage from pests and diseases, access to credit, age of operator, level of farm operator education, size of operation, and specialisation (Nyoro et al., 2007; Mwangi & Kariuki, 2015; and Caswell et al., 2001). The most common areas of technology development and promotion for crops involve new varieties and management regimes; fertility, irrigation, and water (Loevinsohn et al., 2012).

The adoption of new technologies is in many ways dependent on the nature of the technology in question. It refers to the decision by a farmer to utilise a specific technology (Chiputwa, 2011). The level of technology adoption is measured by the percentage of area for which the farmer requires a particular technology.

Technological interventions in Ethiopia have the potential to increase water usage effectiveness in feed productivity and to increase feed use effectiveness of the animals. The question arises as to why smallholders have not adopted agricultural technologies and take advantage of production gains (Gunte, 2015). To answers this, the factors affecting technology adoption need to be examined. There is a significant body of work dealing with smallholders' agricultural technology adoption in developing countries. Agricultural household models hypothesise that a household's decision to use agricultural technologies is influenced by its ownership of physical assets and human resources (Gunte, 2015).

2.11.1 The impact of age in the adoption of technologies

In an economy where knowledge is significant, information processing is based on information and communication technologies (ICTs), an effective balance between human capital and ICT usage is essential for the successful performance and

competitiveness of smallholder farmers. As numerous studies illustrate, older farmers are less likely and less qualified to use ICT compared to their younger counterparts (Meyer, 2007 & 2008). Farmers younger than 30 years use a computer more frequently than smallholders older than 60 (Meyer, 2007 & 2008). Age is extensively considered a socio-economic aspect influencing adoption decisions. A study by Staal et al., (2002) found varying opinions regarding the influence of age on technology adoption and contend that this is largely dependent on the individual farmer and the technology involved.

Adoption and use of agricultural technology in developing countries can play a significant role in leveraging production and productivity in both smallholder and commercial farming (Cash et al., 1992 and Nickerson, 1981). Agricultural sectors that effectively adopt and implement Information Technology (IT) processes understand the important performance benefits. A study done by Baker et al., (2007) reveal that enhancements in production are dependent on application of IT.

2.11.2 The role of gender in the adoption of technologies

Lubwana (1999) noted that on numerous smallholder farms, agricultural productivity resources and technology are generally controlled by men with women contributing 70% of agricultural productivity. This imbalance in new technology adoption means that men are more likely to adopt it than women (Tanellari et al., 2014). Gender-based technology adoption is considered a significant instrument for increasing agricultural efficiency and contributing to food security in developing countries (Mishra et al., 2015).

Female farmers have lower rates of technology adoption, and are more likely to be non-adopters, according to the Food and Agriculture Organization of the United Nations (2011). This poses a challenge to agricultural productivity in Sub-Saharan Africa, where females make up 50% of the agricultural labour force, contributing to the production process.

Despite their high level of participation, women have less access to production resources and opportunities; for example, land, livestock, labour, education, extension, financial services, and technology. This constraint not only affects these women in the agricultural sector, but also contributes to the cost of inadequacy on the agriculture

sector, which impacts the community and the regional economy, and aggravates the problem of world food insecurity. Gender inequality is of concern in all areas of agricultural productivity. This is because men and women farmers share various characteristics but frequently face different constraints when it comes to farming systems.

The question arises whether gender-associated differences in technology adoption can be attributed to specific features of enhanced technologies. The difference is critical, because if gender directly affects the technology adoption process (and more precisely, if women face specific obstacles in adopting enhanced technology), it might be necessary to change research and extension approaches to ensure that the distribution of gains associated with the adoption of technological innovations are less based on gender (Morris & Doss, 1999). On the other hand, if different rates of adoption are produced by unequal access to balancing inputs that affect adoption indirectly, it might be more beneficial to focus on improving access to these complementary inputs by disadvantaged groups – particularly women.

The argument brought by Vankatesh and Morris (2000) regarding the influence of gender on technology adoption, suggests that men are more susceptible towards IT adoption than women, and are also directed toward individualistic tasks and objectives.

Various studies have been done to look at gender differences in technology adoption (Ragasa, 2012). There are important differences in gender variances in technology adoption based on geographical location within and across countries. This emphasises the significance of institutional and the socio-economic situation in shaping constraints and opportunities.

Access to information about technologies and extension services is a main concern in terms of gender differences in technology adoption. The lack of accessible training regarding new and more recent technologies, such as genetically-modified organisms (GMOs), highlights the need for better understanding of these new technologies and stresses the important role of extension agents or rural advisors in bringing this information to both men and women farmers and facilitating their technology adoption.

2.11.3 The impact of education and training in the adoption of technologies

The Organisation for Economic Co-operation and Development (OECD, 2001) argues that over a number of years the policies for agriculture, trade, research and development, education, training, and advice have significantly affected the choice of technology, the level of agricultural production, and farm practices. Numerous factors contribute to the adoption of technologies for sustainable farming systems. Research and development efforts, the movement towards better education and training of farmers, the shift in the focus of advice, more rapid and affordable means of distributing and sharing information, accessibility of financial resources, pressures from consumers, non-government organisations, the media, and the public in general are contributing towards enabling means for the adoption of sustainable farm technologies (Nakano et al., 2015).

Training can affect both the quantity and quality of extension advice, which in turn affects farmers' technical understanding and skills to directly increase production through enhanced technical effectiveness by means of existing inputs, or to indirectly increase production through modifications in input levels, for example enhanced allocative efficiency (Hussain et al., 1994).

As generally expected, educated farmers have a better capability to process information and pursue appropriate technologies to address their production constraints (Asante et al., 2014). Training allows smallholder farmers to access a variety of new knowledge and skills and highlights new methods to operate and innovate farming processes (Platero-Jaime et al., 2017).

Training can also help in the generation of new goods, processes, and technologies. An additional advantage of training the smallholder sector is lower organisational difficulty, which could simply be outsourced. The education system is an important factor in the future success of the smallholder farmers and many governments view this as highest priority. Thus, to be a dynamic tool for future success, education needs to keep up with the latest developments in technology. It is becoming more and more significant for farmers to be able to contribute to an increasingly digital world (Telkom SA, 2015). Investment in education and training is an important provision for socio-economic

development, particularly in countries where the level of human capital contributes to the establishment of the beneficial process of economic growth (Bucciarelli et al., 2010).

2.11.4 Contribution of income in the adoption of technologies

Income also facilitates the adoption of technologies for sustainable farming systems (OECD, 2001). Many policies, including those relating to agriculture, environment, and research and development, provide a combination of incentives and disincentives to technology adoption. Poor levels of education, limited access to information, and pressures on financial resources, for some farmers slow the adoption of some technologies, particularly those that need a greater scale of processes and where the initial investment costs are high.

The more farmers have access to a source of income, the more likely they will adopt agricultural technologies which could possibly increase crop yield (Hailu et al., 2014). It is significant to note that access to income is one of the greatest factors whereby smallholders can be motivated to expand their economic base and adopt essential yield-increasing technologies. Hossain, et al. (2001) are also of the opinion that the farmer's income may have some influence on the development of agricultural production via technological process Study done by Disraeli (2018) found that after the original adoption of new agricultural technologies during the Green Revolution (GR) in Asia, farmers considerably increased their expected income, until 1980.

2.11.5 The adoption of agricultural production technologies in South Africa

Generally, large-scale farmers are more likely to adopt technologies than smallholder farmers as they have more investment capital available to source credible information about the new technologies and experiment on the new technologies. Because of the relative expense of labour cost, large-scale farmers have resorted to the adoption of labour-saving and capital-intensive technologies (DAFF, 2010). Labour-saving and capital-intensive use of technologies appears to be more productive and effective, although they might contribute to high unemployment and declining smallholder farming. This situation may be triggered by high costs associated with these new

technologies and eventually most rural poor smallholder farmers cannot afford adopting them. For example, the use of long-lasting herbicides and more efficient mechanised farming that is expensive to apply, can lead to the loss of employment of seasonal farm employees.

South Africa has a wide range of technologies which have been developed and transferred to farmers to enhance productivity efficiency (Kodua-Agyekum, 2009). The establishment of irrigation schemes, animal traction, enhanced seed, fertilisers, and agrochemical applications are among the technologies developed to help farmers. According to Van Averbeke et al., (2011) argued that these technologies mostly benefit the black smallholder and subsistence farmers through government intervention and other support system.

The adoption rate of these technologies, such as irrigation, fertiliser, and agrichemical applications among smallholder farmers appears to be low, generally because of poor extension services, low participation of farmers in decision-making, as well as a lack of investment capital (DAFF, 2010). Affordable adoption of new technologies, particularly on the small-scale irrigation schemes can lead to an increase in productivity efficiency, production, household incomes, employment, and food security. As outlined by GreenCape (2016), the barriers encountered by Western Cape farmers, include a lack of awareness surrounding the importance and benefits of sustainable agricultural productivity and what is accessible to them, limited technological advice and adoption; low profit margins for importing these technologies; and a lack of funding for the adoption of new technologies. Parvan (2011) indicates that the majority of current review on agricultural technology adoption are mainly focused on Green Revolution (GR) technologies such as irrigation, fertiliser use, and the adoption models of high-yield variety (HYV) seeds.

Because of the advanced process of high-yield variety and the inputs are essential for making them productive, studies investigating HYV adoption seem to focus on extremely advanced forms of technology. HYV seeds are frequently the product of intensive laboratory research, and often this information is bundled with other technology inputs, such as chemical fertilisers, pesticides, and extensive irrigation required for the HYV seeds to perform as intended. There are numerous studies regarding agricultural technology adoption and diffusion which focus on HYV and other

GR inputs. Their findings are concentrated on a “high-tech” description of agricultural technology (Parvan, 2011).

Technology refers to how to farm a crop successfully, according to Zaidi and Munir (2014). In India farming is currently done in a traditional manner and Ahmed (2013) contends that technological innovation and adoption can transform traditional agriculture into modern agriculture. Limited access to or a lack of agricultural technology have several negative impacts on productivity. The term technology, according to Zaidi and Munir (2014: 206) means “application of knowledge and tools accurately for achieving the envisioned goals and economic objectives”. In developing countries, farmers mostly utilise the traditional methods of cultivation which is why their production is low.

Feder et al., (1985) identifies credit constraints as an obstacle to technology adoption in developing economies. Technologies are introduced to boost agricultural production which are frequently accompanied by increases in the input needs, that are expensive for some farmers or nor readily available in specific locations. Even when the technology is neutral to an extent and the presumable fixed financial costs are not extensive, credit hindrances will still limit its adoption. Low external technologies are among the most significant determinants regarding adoption. The role of various factors in determining the adoption rate of technology was established in earlier studies as outlined by Rogers (1995). He discusses five hypothesised technology characteristics which influence the pace of technology adoption. These include:

1) Relative advantage – the degree to which an innovation is considered as being more enhanced than the idea it supersedes, whether measured by economic or social criterion, or its convenience, or the satisfaction it provides.
2) Compatibility – the degree to which an innovation is perceived as being in line with the existing values, past experience, and requirements of potential adopters.
3) Complexity – the degree to which an innovation is considered to be difficult to understand and use. Innovations that need additional skills building and learning would be more difficult than innovations that are less knowledge-intensive.
4) Trialability – the degree to which an innovation may be experimented with on a limited source. Innovations that are easy to experiment with on a partial source are adopted faster than innovations that are less easy to experiment with; and

5) Observing – the degree to which the results of an innovation are observable to the potential adopters.

2.12 Conclusion

The smallholder farmer in South Africa has the potential to contribute to the growth of urban, peri-urban, and rural areas; and the reduction of unemployment, poverty, and food insecurity. Smallholder farmers do not contribute in markets that yield high returns. Smallholder farmers can only contribute to development (rural, peri-urban, and urban) and transit into the commercial farming sector, when the above-mentioned aspects are dealt with effectively and efficiently.

The constraints to smallholder agriculture that pose challenges among smallholder farmers is low technology levels, high transportation cost, a lack of market information, poor support services from the government, and participation in low paying market environments were discussed. Smallholder farmers suffer from a lack of communication, limited extension services and computer use, as well as institutional and technical constraints. Various limiting factors that impede the migration of smallholder farmers into commercial farming in developing countries were discussed in this chapter.

One of the major concerns, among others, is low education levels among the farmers which affects their understanding of the dynamics of agriculture. It is thus evident from the literature that smallholder farming is not sustainable without support from government or other institutions. DAFF, (2012) acknowledges cooperatives as one of the essential pivots to eliminate poverty, unemployment, and high levels of inequality, and to speed up empowerment and growth for the benefit of formerly disadvantaged communities.

Agriculture cooperatives have been found to play a central role in enhancing productivity of smallholder farmers. They offer the institutional structure through which local communities gain control over productive activities from which they make their livelihood. In the agricultural sector cooperatives contribute to food production and distribution, and in supporting long periods of food security. Cooperatives provide capabilities that smallholder farmers would not be have individually such as assisting

them to secure land rights and improved market opportunities. Irrigated farming has the potential to contribute significantly to food security and income of participating homesteads, and to produce employment for both directly and through forward and backward linkages to principal production. Smallholder irrigation systems should be implemented in Africa to improve yields and economic revenues.

Cooperatives should assist producers to guarantee markets and supplies, accomplish economies of scale, and increase market power through conjointly marketing, bargaining, processing, and purchasing supplies and services. Agricultural cooperatives support producers to resolve a shared action issues, for example how to acquire inputs most effectively and to market their outputs on more favourable terms. Commercialisation plays a vital role in increasing incomes and stimulating rural growth, through improving employment opportunities, increasing agricultural rural productivity, direct income benefit for employees and employers, expanding food supply, and potentially improving nutritional status.

Agriculture directly and indirectly contributes to economic development through the provision of better nutrient intake by the poor, food accessibility, food price stability, and poverty alleviation. The agricultural sector can increase the demand for domestically manufactured goods and increase savings. This can eventually result in an increase in capital investment in the industrial sector. Human dimensions in developing countries need assistance to manage natural resources for agricultural purposes, which include driving forces that affect people's decisions; human behaviours which lead to change; the effect of change on natural resources and quality of life; and management approaches to address change in the environment.

The adoption of new technologies among smallholder farmers is affected by many factors, such as socio-economic characteristics of individual farmers, farm features, weather or climate, and risk planning. The importance of extension services for the adoption of modern technologies has been vastly recognised in the literature. The willingness of farmers to attend training sessions has a potential impact on the adoption of technology, and the participation by farmers in on-farm demonstrations empowers them to learn, understand, and apply new technologies in their own fields. Accessing these kinds of capability improvement extension services will ultimately increase the prospect of new technology adoption.

CHAPTER 3: METHODOLOGY

3.1 Introduction

The main purpose of this Chapter is to describe the methods used to obtain and analyse data in this study. This includes a detailed description of the questionnaire, preliminary visits, and the methodology employed in collecting the data required for the study.

3.2 Methodology

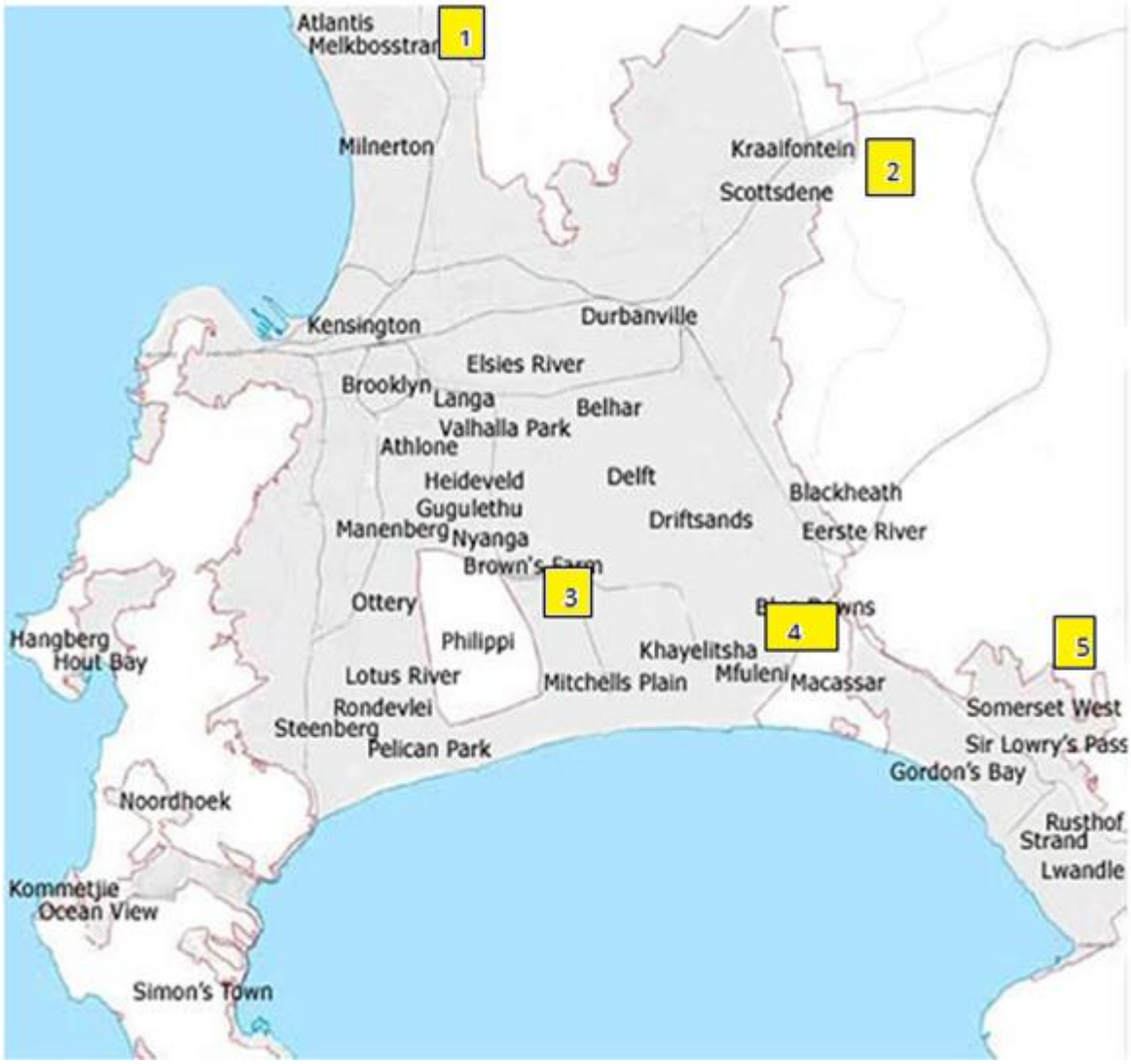
3.2.1 Methodology for objective 1

The first objective of the study was to identify the management, infrastructural, and institutional changes and constraints facing smallholder farmers in the City of Cape Town metropolis.

3.2.1.1 Sample area

As a first step to get first-hand information on the living conditions of some of the current urban smallholder farmers in anticipated study area, 10 smallholder farms in the Cape Town region were visited.

The stratified sampling method was used to identify 10 farming groups in the City of Cape Town metropolis that represent smallholder urban farmers producing a variety of commodities and who are located in different parts of the metropolis. The markets, transportation, available roads, and relative geographic position were considered. After assessing the quantity and location of the population of smallholder farmers in the City of Cape Town metropolis, it was decided to include 10 groups of smallholder farmers (consisting of 39 respondents) namely: (1) Atlantis (eggs and vegetables); (2) Somerset West (bees); (3) Philippi (vegetables); (4) Kraaifontein (vegetables); and (5) Khayelitsha (vegetables) in the metropolis. As indicated, the choice of enterprise covers vegetable crops, bees, and eggs. Map 3.1 indicates these numbered localities.



Map 3.1: Map of the City of Cape Town metropolis

GPS: Latitude: 33º58'S. Longitude: 18º36'E.

3.2.1.2 Collection of data

Primary and secondary sources were used to obtain data.

a) Primary sources:

The primary data were obtained through farmer interviews covering urban smallholder farmers in the metropolis. The main database used in searching smallholder farmers was obtained from the Western Cape Department of Agriculture, as well as online general information about challenges facing smallholder farmers in a developing country.

b) Secondary sources:

i) Questionnaire

To obtain specific information from the sample group of farmers, a questionnaire was developed to obtain information regarding the challenges and opportunities facing urban smallholder farmers in the City of Cape Town metropolis. The questionnaire was also used to gather information on management practices and constraints, especially regarding marketing their produce.

Because the study focused on selected smallholder farmers in the City of Cape Town, the database of the Western Cape Department of Agriculture for smallholder farmers in the City of Cape Town was utilised. Data was obtained by visiting these smallholder farmers and investigating the challenges they face. Open-ended questions were employed to collect data (see Annexure A). Data was collected through personal interviews that took about 45 to 60 minutes per respondent to complete. The 39 smallholder farmers (respondents) consisted of 20 males and 19 females.

While the questionnaires were designed in English, interviews were conducted in both IsiXhosa and English depending on the locality of the respondents. Respondents were interviewed in IsiXhosa at Khayelitsha, Philippi and Kraaifontein, due to IsiXhosa being the predominant language of the area. In Somerset West interviews were conducted in English, and in the Atlantis district interviews were conducted in both English and IsiXhosa as most of the respondents were either Afrikaans- or IsiXhosa-speaking. The questionnaire covered the collected of data on attributes such as age, educational levels, gender, farming experience, farm name, region, and computer use.

It took approximately one month to conduct all the interviews on the 10 farms. All interviews were personally conducted by the principle investigator.

ii) Processing of data:

The Statistical Package for Social Sciences programme was utilised to analyse data. It is a program used to analyse data in the behaviour sciences. The descriptive statistics giving frequencies and percentages in cross-tabulation format that were interpreted within the context of the study. Tests of statistical significance (T-tests) were used to analyse and describe the significant trends and to make forecasts. Data was analysed

using Microsoft Excel and then imported into the Statistical Package for Social Scientist (SPSS).

SPSS is a programme which allows the researcher to analyse and describe data. The descriptive statistics was used to analyse information such as demographic information, options, and channels that the farmers use to sell their produce. It was discovered that it is significant to adhere to a simple approach that enables the research to close all the information gaps identified during the data collection processes and come up with recommendations (Babbie & Mouton, 2012). The Statistical Package for Social Sciences (SPSS) was utilised to analyse the data in order to determine if there is a significant difference in the use of computers by people in the 20 to 40 years age group compared to those between 41 and 78 years of age.

When comparing age with computer use in this study by using SPSS, it was found that there was no significant difference at 95% test level among the two groups (p = 0,0739).

3.2.2 Methodology for objective 2

Objective 2: To assess the available support from government and other organisations for smallholder farmers in the City of Cape Town.

The investigator used available information from government officials from different departments, non-government organisations (NGOs) and the City of Cape Town. Information required mostly focused on the support by these role players to smallholder farmers.

3.2.3 Methodology for objective 3

Objective 3: To recommend possible strategies that policymakers could consider for implementation to assist smallholder farmers.

Proposed strategies are presented in Chapter 5.

3.3 Conclusion

The study was carried out in the City of Cape Town metropolis, situated in the Western Cape Province of South Africa. The respondents consisted of 39 smallholder farmers and were personally interviewed through face-to-face discussions and completion of a questionnaire in the preferred language of interviewee. To analyse data, descriptive statistics were employed. The main descriptive indicators that were used were frequency and mean values.

CHAPTER 4: RESULTS AND DISCUSSION

4.1 Introduction

This chapter discusses and analyses results of the field survey that was carried out. The data was collected from the 39 smallholder farmers involved in agricultural commodity production. The chapter starts with a description of the demographic profile of smallholder farmers, while results of descriptive analysis are also presented. This is followed by an overview of the support respondents received from government and the challenges faced by them. It goes on to discuss steps taken by respondents to reduce risk, and provides an overview of the smallholder farmers' maintenance plans.

In each paragraph, the results of this study will be provided while it will then be discussed within the context of available literature and the situation in the study area.

4.2 Overview of demographics of respondents

4.2.1 Age distribution of respondents

Stats SA (2005 & 2015) describes youth as being between the ages of 14 and 34, while the European Social Survey (2012) observes on average youth as ending at 35 years of age. During this stage, people complete their education; they become economically active; they start assuming new roles and responsibilities in their communities; they take up work and develop skills in their new work roles; or they may experience times of unemployment. According to Stats SA (2005), the years between the ages of 35 and 64 are described as adult (mature) and are essentially periods of consolidation of one's positions and roles in society. However, it is also a period of change, of watching one's children develop through infancy, childhood, and early youth to become adults, and then possibly moving away from the family home due to career change, from reaching the height of one's career path or stable work situation to planning for retirement, and passing on acquired skills and roles in the work place to younger people. During this time of life, the death of at least one parent is likely to be experienced, and these circumstances may require emotional adjustment.

The person's role may change to one of becoming a grandparent, in addition to being a parent of independent children. During this period, the person may start to confront some of the consequences of the aging process, in relation to their lifestyle. For example, certain health risks and problems may manifest themselves. At this stage, relatively few people tend to be concerned with completing their education or improving their qualifications. The work place may become the main means of material improvement, not only of their own life circumstances, but also of their dependents'. They may also continue contributing in various ways, financially and otherwise, to their communities and the wider society.

Researchers have different views about old age. According to the European Social Survey (2012), old age starts at 59 years; at the same time Stats SA (2005) describes the age of 65 years and above as elderly (old). It is considered an important time of accepting new roles and new life status. It is the time one to retire from work; one may become a grandparent or great-grandparent; and one may find fulfilment through new activities such as being responsible for an extended family, charity work, or other interests, while possibly continuing to pass on the skills acquired through the years of life experience to the younger generation. During this time of life, emotional adjustments may need to be made in relation to accepting the aging process. The death of a spouse may become a reality. The person's role may change from one of being independent and self-sufficient to one of becoming dependent on others for physical and financial assistance. During this period, new health risks and problems may emerge.

As discussed in Chapter 3, respondents of this study were located in five areas in the Cape Town Metro, namely: Atlantis, Kraaifontein, Khayelitsha, Philippi and Somerset West. In the study the ages of these respective respondents were asked. The results are indicated in Table 4.1.

Table 4.1: Age distribution of respondents

Age groups (Years)	No. of respondents	Percentage (%)
20-30 years	7	18,0%
31-40 years	5	13,0%
41-50 years	9	23,0%
51-60 years	6	15,0%
61-70 years	8	21,0%
> 70 years	4	10,0%
Total	**39**	**100,0%**

The information in Table 4.1 indicates that farmers are grouped into their age groups/categories; most respondents were in the age group 41 to 60 years. This group is represented by 15 respondents (38%), followed by 12 respondents (31%) in the age group 20 to 40 years. Thus, the majority of respondents can be regarded as mature (41-60 years). Generally, age gives an indication of whether the smallholder farmers are young, mature, or old farmers (Stats SA, 2012). Smallholder farmers are grouped according to the various stages in the life cycle and therefore, analysis presents collected data from interviewed smallholder farmers in the City of Cape Town metropolis.

The young people in these five areas (Atlantis, Kraaifontein, Philippi, Khayelitsha and Somerset West) seem to be less interested in farming, or they are busy with other non-farming activities, such as working or studying; while the older group consists of pensioners, including one retired teacher, who farm for a supplementary income. Respondents are grouped according to their age categories. The processes of identifying and classifying others into age groups is called age categorisation (European Social Survey, 2012). Age, according to Raphela (2014), primarily determines the interactive intentions of household and community members. As opposed to recognised rules and patterns, young farmers who are energetic participants in agricultural farming are considered to be smarter than their older counterparts who have gained experience in the sector over a period of time. The older farmers are likely to have more resources at their disposal, which might enable them to cover the costs of marketing sooner than younger farmer, despite being less inclined to pursue more profitable markets.

4.2.2 Distribution of respondents according to gender

Bandama (2016) and Bryson (1981) found that most studies show that women would be equally competent to reach the same yields as men, if they had equal access to production resources, services, and inputs. These resources include technologies that eliminate time spent in production. Closing this gender gap will contribute improving yields and thus, food and food security globally. This would enable women to participate in other economically feasible activities that contribute to the economy. In the study there was a more or less even gender distribution among the respondents.

The crucial role played by women in developing countries in different stages of agriculture is recognised by Raidimi (2014), WIEGO (2017), Bandama (2016), and Bryson (1981). Women produce and make ingredients for numerous global foodstuffs; their contribution frequently goes unnoticed, unseen, and unpaid. Women mostly, supply the majority of agricultural labour, while transporting crops to market and sales are mainly left to the men. This creates problems for women in terms of both leadership and income. Women in the smallholder sector, according to WIEGO (2017) have been helped by improved efforts by the United Nations, donors, and development organisations to nudge governments towards additional advanced policies and legal reform that redress gender disparities. Nevertheless, even where a favourable policy situation exists, the gap between implementation and policy remains significant.

Bandama (2016) claims that not all women in the agricultural sector are smallholder or subsistence farmers or supply labour to the industry. Bandama (2016) finds it difficult to define the essential role of African women in agriculture and agribusiness, mainly because it is such a rich and heterogeneous cluster of people within a big and non-homogeneous locality. However, even within the smallholder farmers group, there is a great deal of diversity. Women in Africa face constraints in accessing resources and information and their needs can be as diverse as they are. Nonetheless, they all have some input in the sector and the economy. Studies by Farming First, the Food and Agriculture Organization of the United Nations and other organisations indicate that all over the world women farmers manage small land holdings but make far less use of enhanced inputs such as fertiliser and improved technologies. Women tend to have less access to credit and insurance and are less likely to obtain extension services,

which are the key source of information on new technologies in the developing countries.

Women in developing countries are responsible for 60% to 80% of smallholder farming, however, due to legal and cultural challenges such as land inheritance, ownership, and use, less than 20% of landholders are women. These figures could be higher for South Africa where women can legally own and inherit land. Despite this, even in South Africa, historical constraints with regard to land ownership still negatively affect women in general (Bryson, 1981).

Female farmers produce relatively small quantities of produce on relatively small plots of land. It is clear that women play a significant role in agriculture in Sub-Saharan Africa, although they face constraints, such as time – as women spend less time on farm work and longer hours on housework and other paid or unpaid work due to gender based-separation of labour with regard to childcare and household responsibilities; mobility – women are less mobile than their counter parts due to their child care and household responsibilities; and education and training – women are less educated in most of the developing countries. Furthermore, the lack of education limits their ability to obtain technical knowledge and skills (Bryson, 1981).

Raidimi (2014) suggests that gender concerns must be addressed in development. This is also relevant to the agricultural sector, where gender disparities regarding access to and control over resources are persistent, and negatively affect the sustainable and complete development of the sector.

Table 4.2: Distribution of respondents according to gender

Gender		
Respondents	**No. of respondents**	**Percentage %**
Female	19	48,7%
Male	20	51,3%
Total	**39**	**100%**

Table 4.2 illustrates that there is more or less gender equality among respondents.

4.2.3 Farming experience of respondents

Raphela (2014) states that farming involves a systematic knowledge and understanding of the changing aspects of agricultural farming which include the value chain, planning strategies for maximum yield, organising sector administration, working machinery, and managing staff.

The questionnaire made provision for the respondents to indicate their experience (in number of years). The results are indicated in Table 4.3.

Table 4.3: Farming experience of respondents

Experience (Years)	No of respondents
1	3
2	5
3	10
4	4
6	2
7	5
10	2
11	3
13	4
14	1

Most smallholder farmers interviewed have been involved in the farming industry for a number of years, although their productivity levels have consistently been very low due to a number of challenges. Farming require the farmer to have some degree of experience and the less the experience, the higher the likelihood that the farmer will face constraints. As the smallholder farmers who were interviewed have been involved in farming for some years, it is likely that their experience will assist them in dealing with most of the constraints they face daily.

It is generally accepted that farmers have an important role to play in farming and bringing about sustainable innovations in agriculture. Farmers are vital transporters of knowledge and it is not surprising that farmers' knowledge attracts more attention now than ever before. Farmers' knowledge refers to the ability to meaning fully coordinate and integrate practices in different areas of farm labour. Farmers' knowledge refers to the application of different farming methods, production objects, processes, and subprocesses (Stuiver et al., 2004).

Statistics Canada (1996) found that agriculture has become more knowledge-intensive and fast-changing, making farm management more complex. Skills and knowledge are becoming more significant for success. By using a broad range of management skills and practices, farmers could positively influence their financial performance. In a rapidly changing environment, strategic business planning and continuous learning are becoming increasingly important.

4.2.4 Distribution of respondents according to computer use

As discussed in Chapter 2 (literature study), computers play a very important role in farm management (Gonzalez, 2012). Brookes et al., (1992) mention that several the planning tasks can be executed using computerised models. These include, calculation of nutrient requirements for specific production objectives and/or production attainable from detailed nutrient intakes; diet formulation by means of linear programming to give best possible combinations of dietary elements at lowest amount; distribution of pasture to grazing animals based on tasks describing herbage allowance or lasting dry matter to herbage intake; and medium- to long-term feed planning by means of models that range from easy feed budgets to active entire farm reproduction.

In the questionnaire (see Annexure A), respondents were asked several questions regarding their use of computers and the types of software they use. The results are indicated in Table 4.4.

Table 4.4: Computer use by respondents

Variables	No. of respondents	Mean	Std Dev
Computer use	15	42,9	13,3
Non-computer use	24	52,3	16,8

It can be seen in Table 4.4 that 15 of the 39 respondents (38,5%) use a computer in their farming business whereas the majority (61,5%) do not use a computer. The youngest person using a computer was 23 and the oldest 73, while the ages of the respondents who did not use a computer ranged from 20 to 78 years.

From the theory (Smith et al., 2004) it is evident that people of a certain age (20-40 years) are more likely to use computers than older people (41-78 years). Young smallholder farmers are considered to be better educated than aged farmers and are thought to be intellectually stronger than older farmers (Mdlalose, 2016). Kumalo (2014) argue that farmers above 40 years of age get less exercise because of decreased physical capacity. Older farmers are usually less productive than younger smallholder farmers (Guancheng et al., 2015).

4.2.5 Educational level of respondents

In the questionnaire the respondents were asked to provide information regarding their highest qualification. Figure 4.1 provides an indication of these qualifications, grouped according to the districts where respondents farm.

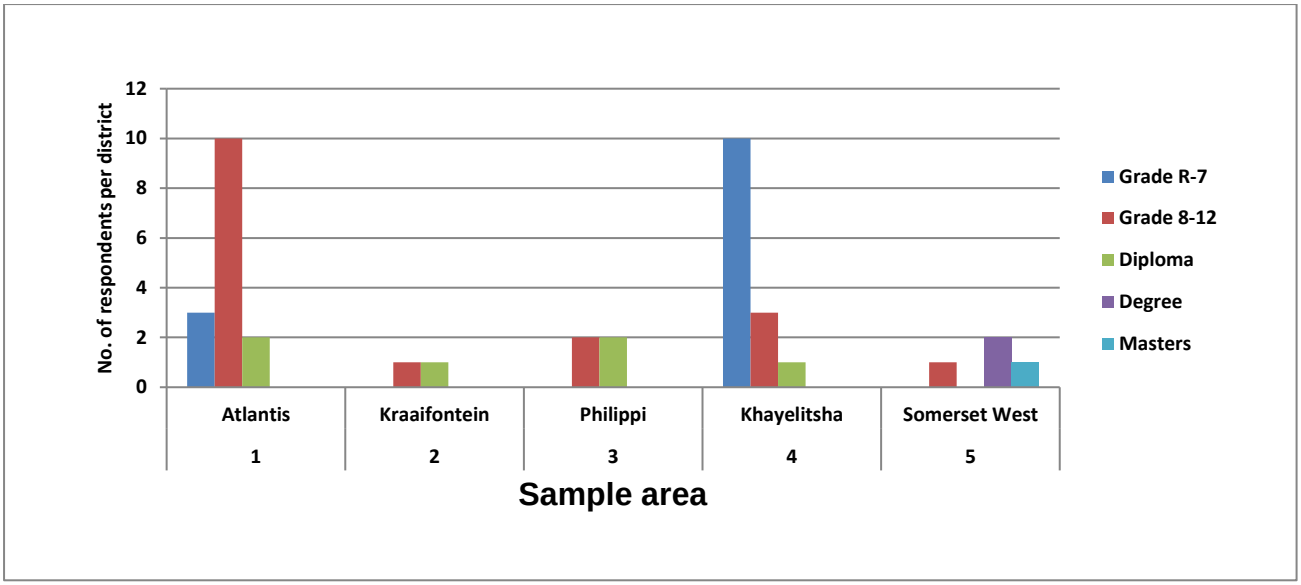


Figure 4.1: Educational level of respondents from the respective sample areas

As can be seen from Figure 4.1, the majority of respondents (15 each) live in Atlantis and Khayelitsha, followed by Philippi with four respondents. Three respondents were from Somerset West, while only two respondents from the Kraaifontein district participated in the study. Most of the respondents from Khayelitsha were in the group with the highest level of training in the Grade R to 7 category, while most of the respondents in Atlantis were in the Grade 8 to 12 category. Somerset West had one respondent (2,5% of total) with a master's degree and two respondents (5,0% of total) with Bachelor degrees, while the remaining sample areas has six respondents (15,4% of total) that possess a diploma. Furthermore, the highest level of training of 17 respondents (46,4% of total) was Grade 8 to 12, while 13 respondents (33,3% of total) have attained training levels of between Grade R and Grade 7.

The educational level of most of the smallholder farmers interviewed was found to be very low, especially in Khayelitsha followed by the Atlantis area. However, they remain passionate about agriculture and are willing to learn more about the latest technologies and developments in the sector since it is their source of income, and maintains their livelihood. Raphela (2014) argue that scientific studies conducted in numerous developing countries has established the significance of education in the decision-making process with suggestions for socio-economic development and human capital production.

Research has similarly recognised that for the agricultural farming, the role of education is vital to enhance practices in traditional agriculture. The low levels of education among

smallholder farmers in two regions of the City Cape Town metropolis is expected to impact negatively on their production activities; however, that can be countered by good extension support. As discussed earlier, the majority (15 each) of the respondents farm in Atlantis and Khayelitsha. Because Philippi had only four respondents, followed by Somerset West with three respondents and Kraaifontein with only two respondents, it is scientifically not possible to calculate a correlation between district and highest level of qualification among the respondents.

According to Binns et al., (2012) smallholder farmers in many developing countries are confronted by many important social challenges, such as limited formal education and literacy levels that can weaken their capacity to discuss reasonable commercial agreements with providers and customers; apply for government support programmes; register for land rights and participate in other institutional agreements. It is noted (Kyama, 2015) that agricultural farming is expected to produce eight million permanent jobs by 2020 and up to 14 million jobs if growth in the smallholder sector is enhanced. The future of agricultural farming depends on science, technology, and education in particular.

Faculties of agriculture and agricultural colleges and universities are primary shaped in the belief that farm production could be increased as a result of the systematic application of current technology and agricultural research findings (Alam et al., 2009). The task of these educational institutions is to scientifically teach agriculture with the input of the farming community; to take the results to a broad variety of farmers who can use them; and to train farmers, extension workers, agricultural teachers, and researchers so that agricultural production could continue to be increased on a sustained basis. Intermediate and higher education in agriculture continues to play a decisive role in rural development and sustainable agricultural production. It is generally thought that education (universal, as well as specific agricultural education and training) is an aspect which has an impact on agricultural productivity (Narman, 1991). An increasingly interdependent world is producing new challenges for institutions teaching agriculture. Over the years, the world has changed, and in many of the developing countries, agricultural education and training have failed to adapt and respond to the realities of rural societies.

It is evident (Ngemntu, 2010) that small-scale farmers, particularly in rural areas of South Africa, have little or no formal education. Consequently, they are generally unable to make informed choices regarding farming. It is noted in the literature that small-scale rural farmers in South Africa are face with limited business knowledge, no organisational skills, and a lack of information on technologies, markets, and prices of products when there is a surplus. The lack of education and experience and its negative impact on farming and markets is seen by the small-scale farmers in South Africa as the main challenge to sustaining and improving their livelihoods.

4.2.6 Government support to respondents

As mentioned earlier, the respondents were located on 10 farms within the five sample areas. In the questionaire they were requested to indicate if they have received government support in the past and the results is provided in Figure 4.2.

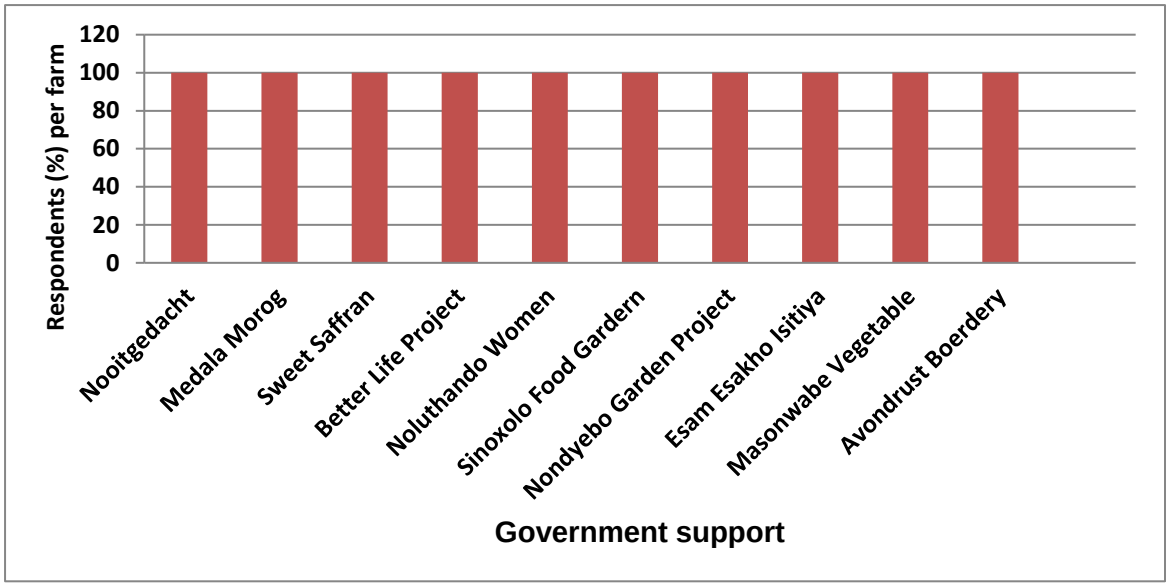


Figure 4.2: Government support received by respondents

It can be seen that the respondents on all the different farms (100%) received some kind of governmental support in the past. However, this support differs from farm to farm. For example, in the case of Nooitgedacht farm in Atlantis area, the Department of Rural Development and Land Reform bought an egg production farm with smallholder farmers as the beneficiaries. The farm was up and running during the time of purchase. At Avondrust Farm in the Kraaifontein area, smallholder farmers were given a car and

tractor by the Department of Agriculture. The rest of the respondents received sprinkler irrigation, seedlings, organic manure, electricity installation, fencing and tools (spade, wheelbarrow, rake, fork spade, two containers and watering can). In addition, respondents received work clothes, such as overalls, boots, and gloves from the Department of Agriculture.

Mudhara (2010) contends that the government should also support other areas that could add to increased production through empowerment and provision of support to smallholder farmers. The support must include financial assistance, extension services, input supplies, and subsidies and the implementation of structural changes to the economy. Hall and Aliber (2010) found that despite of a significant increase in budget distributions over the past years, it has had little effect given the relatively small investment in smallholder agriculture. This might be due to the small number of individuals involved in agriculture, mainly on a small-scale, frequently part-time, and mostly with little or no contact with the official programmes supposed to assist them. Government support should be given to respondents to mitigate the daily challenges they face on their farms.

Erasmus (2014) discusses how, over five years, government will direct immense resources and energy to support smallholder farming to stimulate food security. The plans of the Department of Agriculture, Forestry and Fisheries, to address household food security will depend on developing subsistence farming, the creation of household food gardens, and increased support for smallholder farmers. Once smallholder farmers have been supported for three years they should have gained sufficient skills for them to be able to farm independently and sustainably (Erasmus, 2014). Aliber and Hall (2012) mention the South African Government's objectives to enlarge the smallholder sector as part of its wider job creation initiative. Studies show that government's efforts to support smallholder farmers have largely been expensive and unsuccessful. Although the budgetary distributions to the smallholder sector have increased significantly over the past ten and a half years, the delivery and use of these funds are such that few farmers benefit and the general effect is negligible.

Sikwela and Mushenje (2013) note that several Farmer Support Programmes have been established in South Africa to reduce the risk posed by smallholder farmers' lack of economic and/or financial knowledge. Facilitation activities have been introduced to

help these smallholder farmers to move out of poverty through agricultural production. Regrettably, smallholder farmers are more constrained by institutional problems, which include limited access to information, a lack of technical knowledge, and high marketing and transaction costs giving rise to low quality and quantity production.

Directing small-scale agricultural enterprises is important in addition to new and innovative public-private corporations, improved public investments in research and extension programmes, and development-oriented local governance and institutions (Watson, 2008). This is possible through growing cooperatives, farmer groups, business associations, and scientific organisations, and visibly supporting the requirements of small-scale agricultural producers, and entrepreneurs to capture and enhance value to on-farm, post-harvest, and off-farm enterprises. The support systems for smallholder farmers must be clearly and effectively target the needs of this sector to reach some agreement on how to identify smallholder agricultural producers and categorise the different conditions in which they can be found (Phuhlisani, 2008a).

The support systems for the smallholder sector must be holistic and must provide all types of support concurrently. Phuhlisani (2008b) believes that support for the smallholder sector will enable farmers to sustain their main livelihood through agricultural production and make the move to permanent farming. Hall and Aliber (2010) contend that South Africa has officially deserted the small-scale farmers, despite various policies and programmes that claim the opposite. A radical increase in budget allocations to agriculture over the past years has only made a slight impact on the chronic challenge of under investment in the small-scale sector in South Africa. This is because of the large number of people involved in agriculture, frequently on a small-scale, regularly part-time, and mainly with little or no involvement in the official programmes supposedly established to assist them.

4.2.7 Challenges faced by respondents

In the questionnaire the respondents were asked about the most important challenge they face regarding farming, and the results as indicated in Table 4.5.

Table 4.5: Challenges faced by respondents

Problem mentioned	No. of respondents	Percentage (%)
Chicken diseases	10	26,0%
Cost of inputs	1	3,0%
Require egg grader	1	3,0%
Need tractor	2	5,0%
Require administrative skills	4	10,0%
Land requirement	3	7,7%
Need equipment	2	5,0%
Appropriate clothes	1	2,5%
Animal (birds and moles) problem	2	5,0%
Insect problem (snails)	3	7,6%
Need tunnels	3	7,6%
Theft problem	1	2,5%
Financial assistance required	1	2,5%
Reliable market	1	2,5%
Water requirements	1	2,5%
Organic material(manure) requirements	3	7,6%
Total	**39**	**100%**

Source: Field survey, 2015

Table 4.5 shows that all 39 smallholder farmers face various challenges on their farms. The respondents are grouped according to the challenges they face daily. Government, non-government organisations, and other organisations can support these smallholders by addressing the listed challenges. Government intervention could be in the form of financial assistance, extension services, marketing, and input assistance, and marketing and infrastructure development.

The important role which policy makers can play in assisting smallholder farmers to achieve their goals is discussed in Chapter 5. The urban agricultural policy for the City of Cape Town (2006) realised that smallholder farmers require support. The support which the City will provide to these farmers is by subsidising the supply of water to the farms. The City of Cape Town also supports and promotes urban agriculture within the

perspective that it will not destroy the quality of life of citizens, will not impact detrimentally on public health or the natural environment, and will contribute to the social development and well-being of communities. The City's policy was established in the spirit of cooperative governance and building of strategic partnership. Table 4.5 provides evidence that smallholder farmers that were interviewed in the City of Cape Town metropolis face a variety of constraints that could be addressed or reduced through government mitigation or intervention.

Mmatsatsi (2007) noted that most agricultural development organisations are still studying how to deal with the special conditions and requirements of smallholder farmers. The consequence is that the National Department of Agriculture has all but lost direct control over tools and institutions with which it could possibly impact agriculture. The Department of Agriculture started the Broadening Access to Agriculture Trust (BAAT) plan in the 1990s to supply such services to smallholder farmers, but apparently it did not proceed further than the planning stage. It is not easy to claim that government policies and programmes to support the smallholder sector in South Africa are adequate when the present situation of policies is either unsympathetic to these farmers' interests or disregards them completely.

Government intervention to assist smallholder farmers through extension programmes is believed to assist farmers through educational interventions to improve farming processes and methods, increase production effectiveness and income, improve their standard of living, and raise the social standing and educational levels of farmers (Zwane, 2012). UNCTAD (2015) found that the level of smallholder farmers' contribution to input and output markets partially defines their productivity and later earnings. Farmers use a variety of inputs in the production process, among others seeds and fertilisers, land, labour, and credit. DAFF (2013) initiated the Strategic Plan for Smallholder Support (SPSS) with the intention to organise, support, and establish entire programmes that target support and development of smallholder processes towards accomplishing optimum utilisation of resources for continued food security and economic returns.

4.2.8 Measures taken by respondents to reduce risk

In the questionnaire, respondents asked to describe the measures that they took to reduce physical risk. The results are depicted in Figure 4.3

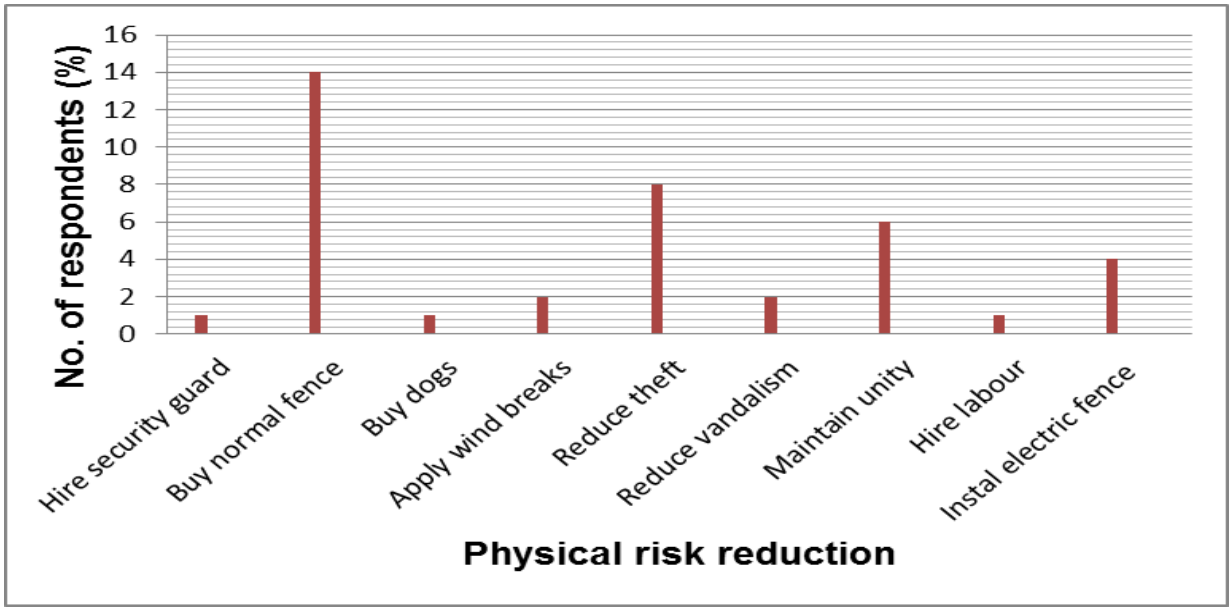


Figure 4.3: Measures taken by respondents to reduce risk

Figure 4.3 depicts the variation of measures that respondents took to reduce physical risk. The majority, that is, 14 respondents (36%) erected fences, while one respondent (3%) has a security guard, and another respondent (3%) keeps dogs. Two respondents (5%) planted trees as wind breaks. Eight (20,5%) of the respondents suffered loss due to theft, and vandalism was experienced by two respondents (5%). Six (15%) respondents mentioned the importance of maintaining unity as smallholder farmers. One respondent (2,5%) in Khayelitsha employed hired labour on a daily basis, and four respondents (10%) have installed electric fencing.

Kahan (2008) describes the farming as a risky practice. Farmers deal with risks and make daily choices that affect their farming processes. Several factors that affect the decisions that farmers make cannot be predicted with accuracy. These include changes in weather conditions, price variation at the time of harvest, unavailability of hired labour at peak times, machinery and equipment breaking down at the time it is required, drought, animals may die, and government policy may be rapidly changed. These are only some of the risks that farmers encounter in managing their farming businesses, which affect profitability of their farms. Farmers in the developing world are often faced

with uncertainties. These farmers live on the threshold of dangerous insecurity, at times falling just below, and sometimes rising just above the edge of survival.

Farmers do not know whether the rainfall for a season will be good or bad; they do not know what prices they will get when selling their produce; and they do not know whether their crops will be affected by diseases. Most of farmers' risks are not under their control; therefore, some have introduced means of dealing and managing risks. Kahan (2008) identified the common causes of risk in the farming sector. These are divided into five areas:

1) Production and technical risk

This refers to crop and livestock performance that depends on biological processes that are affected by weather and pests and diseases. Drought could lead to low yields. The outbreak of diseases may also cause major yield losses in crops and livestock. Equipment is another cause of risk, because a farmer's tractor might break down in the production season resulting in an inability to harvest in time, which will affect yields.

2) Marketing risk – prices and costs

The dynamics of price changes in the market are beyond the farmers' control. The price which the farmer gets for a product is affected by the supply of the product, demand for the product, and the cost of production.

3) Financial risk

Financial risk is incurred when money is borrowed to finance the farming business. This risk might be caused by doubt about future interest rates, the lender's preparedness and capacity to carry supplying funds in time of need, and the capacity of the farmer to generate the income needed to repay the loan. Smallholder farmers who borrow money at high interest rates often find it difficult to repay their debt.

4) Institutional risk

This refers to the unpredictable changes in the supply of services by institutions that support farming. The institutions can be either formal and include and involve banks, cooperatives, marketing groups, input dealers and government extension services. Part

of institutional risk is constraint in government policy with regard to farming, such as price support and subsidies.

5) Human risk

Human risk refers to the risk to the farm business due to illness or death and the well-being of the farm family. Death, illness and accidents may negatively effect on-farm performance. For example, the incidence of HIV/AIDS has had a serious effect on labour availability and productivity in some areas.

Risk can be overcome by employing extension officers as they play an important role in helping farmers to make choices regarding risk management. Extension workers must be able to provide guidance and support. They must have a sound and practical knowledge of the risks that farmers in a particular area are likely to face, and the variety of risk management approaches available to them.

4.2.9 Physical maintenance plan of respondents

Respondents were asked about their farm maintenance plan. Their responses are shown in Table 4.6

Table 4.6: Physical maintenance plan

Plan	**No. of respondents**	**Percentage (%)**
Have a maintenance plan	11	28,0%
Improve fencing	1	3,0%
Secure building against vandalism	**5**	13,0%
Lock containers	1	2,5%
Farm theft reduced by erecting fence	1	2,5%
Fix leaking pipes	11	28,0%
No plan	9	23,0%
Total	**39**	**100%**

Source: Field survey, 2015

Table 4.6 shows that respondents have different views regarding a physical maintenance plan. Nine respondents (23%) respondents have no plan, while the majority of respondents (30 or 77%) have some form of maintenance plan, for example improving or erecting fencing; securing buildings, locking containers, reducing theft by keeping dogs, employing security personnel, and fixing leaking pipes.

1) Maintenance plan

According to Phillips (2012), agricultural machinery and implements are vital to any commercial farming operation. It is equally important that this equipment is well managed and maintained. The major significance for tractors, implements, and other agricultural equipment comes with criterion on any successful large-scale commercial farm. Machines have a vital role to play if farmers and workers are to perform essential tasks quickly and efficiently, and to ensure that the business generates profit. To avoid costs, tools must be strictly monitored, serviced, and repaired, or replaced when necessary.

To maximise maintenance efficiencies, it is important to keep detailed records of all equipment, noting operating hours, planned services, breakdown responses, and historical data. This allows the farmer to keep an eye on the warranties of parts and the performance history of each machine. This is especially helpful if an implement gives regular problems and putts the farmer on a strong footing when it comes to negotiating problem-solving responsibility with equipment dealers. Maintenance is necessary to keep machinery in a functional state so that quality work can be produced; to keep property in an acceptable condition; and to diminish the cost of lost production due to equipment breakdown (Wedd, 1999).

The benefit of having a maintenance plan is that any breakdowns that occur can be investigated. Without records regular breakdowns may go unnoticed. Records assist in identifying and repairing faults early. Records also permit maintenance planning and early ordering of spares. The significance of a successful maintenance plan and its important role in the efficiency of farming cannot be ignored (Krar, 2015). The key advantage of regular maintenance is that it ensures that all equipment required for production is always functioning at 100% efficiency. Through short daily inspections, and making minor adjustments, minor problems can be identified and resolved before

they become the major problems that can shut down production. A good maintenance program requires the cooperation and participation of everyone involved.

2) No maintenance plan

FAO (1982) list a few reasons for poor or no maintenance, among others, insufficient funds available for maintenance; a lack of interest of the farmers to participate or collaborate in the maintenance work; and poor organisation of the work. The most general cause for poor maintenance in public irrigation schemes is insufficient funds for servicing and repairing tools. This does not only affect the maintenance, but the whole management of the farm. A lack of interest of the farmers to contribute to maintenance work is from time to time the major cause for a state of disrepair of the tertiary canals or water courses for which the farmer may have been made accountable.

The reason for this lack of interest, demonstrated by the farmer disassociating himself/herself from repair and maintenance work, can have various, often complex, causes. In some cases, the farmer does not understand the significance of maintenance work; he/she does not know how to do it, or feels that his/her work will benefit others rather than him/her. In other cases, the farmer does not view the irrigation system as his own and therefore deliberately avoids any participation in the maintenance work. To improve these conditions, each case should be analysed to ascertain the reasons for non-participation. The assistance of sociologists could be helpful in determining this. Poor maintenance may also result from inadequate planning of such work, or it may be that the available resources have not been used to the best advantage. Insufficient maintenance plan will contribute to increased repair costs, shortened working life, decreased trade-in value, and increased downtime, and will consequently reduce the farmer's profit (Wedd, 1999).

4.3 Conclusion

It is evident that the respondents are faced with several constraints in achieving their goals which prevent them from graduating to becoming commercial farmers. It is noted that smallholder farmers play an important role in job creation, food security, and employment in developing countries – especially in the rural areas. There is no reason to believe that the small-scale industries cannot survive in the face of keen competition

with big industries, if an effective support system is available. As extensively discussed in Chapter 2, a smallholder sector with access to farmer support services will be able to overcome constraints and to progress to commercial agriculture. To dispense the benefits of agricultural growth more widely, there is a need for effective implementation of policies and agricultural investments that will allow smallholder farmers access to formal markets and promote long-term development.

Market participation is significant to drive the much-needed agricultural reform and to participate to income growth especially in rural areas. Nevertheless, opportunities to make such a contribution are still too inadequate among smallholder farmers due to the current constraints, which is regrettable as agriculture has a significant potential to develop rural incomes.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

In South African the smallholder sector has been identified by DAFF (2012) as the main source of livelihood (poverty alleviation) for the rural poor communities, despite its low and declining performance in terms of productivity. Due to government's acknowledgment of the significance of the smallholder sector, numerous efforts have been made to improve its performance in the face of increasing food insecurity, unemployment, and the extensive spread of poverty, and its potential to contribute to economic growth. It is regrettable that the potential of smallholder farmers remains unused due to their limited access to and participation in markets, and the numerous production challenges they face. The need for these farmers to increase market participation and graduate into commercial farming, so that they can contribute to the economic development of the country, has already been discussed.

The objective of this study was to investigate the challenges and opportunities faced by urban smallholder farmers in the City of Cape Town metropolis. The results of this study agree with literature which indicates that that the smallholder sector faces a few marketing and production constraints. However, smallholder farmers in the Cape Town metropolis do not only face challenges but also opportunities in agri-production and processing and agro-processing in the City. Agro-processing is designed to assist small-scale farmers to cross to commercial farming. This will give them access to markets, extension services, and financial support.

The environmental conditions with which smallholder agriculture compete are at a crossroad in terms of conventional agricultural practices and sustainability considering the climate change developments. Generally, smallholder farmers are considered to have low production levels due to challenges with which they are faced. This should be viewed in the context of the economic, social, environmental, and institutional conditions within which they operate. Given the pervasive level of poverty in rural South Africa, smallholder agricultural financing is the solution to realising agricultural growth to eradicate poverty at an advanced level of impact. Enhancing the smallholder sector may have an extensive impact on the economy, environment, and social position of the households and communities concerned.

The prioritisation of smallholder agriculture has been identified in the policy programme of various developing countries. Thus, there is overwhelming agreement that the "business as normal" approach is bound to leave enormous numbers of smallholder farmers trapped in poverty with inadequately low incomes or incapability to maintain their livelihoods. To facilitate the sustainable growth, development, and commercialisation of smallholder farmers and to improve their livelihoods, government must establish partnerships with the private sector and other non-governmental organisations to focus on addressing deficiencies in the general characteristics of smallholder farmers, marketing challenges, production constraints, and support systems for smallholder farmers.

The government and private sector should ensure that the link between smallholder farmers and markets is strengthened. They need to establish interventions to assist farmers who are poorly resourced or unresourced in terms of access to credit and finance, research and extension services, and human capital development. Despite the agricultural policy reforms smallholder farmers have not been integrated and helped to penetrate commercial agriculture. These farmers require comprehensive sustainable support to ensure that they produce quality products that are acceptable to the market. Institutional modernisation such as farmer services is needed to address these challenges. This can help to develop access to markets, credit, suitable training, and provision of infrastructure and service delivery applicable for marketing.

The conclusion of this study is that under present conditions, most farming schemes are not economically feasible if not subsidised by off-farm sources of income. Under the existing conditions, smallholder farmers are not able to sustain the viability of their plots without the support of government.

5.2 Discussion of hypotheses

The hypotheses set for this study was satisfied, i.e.:

1. H_1: Smallholder farmers in this study are faced with various challenges which limit their ability to perform.
2. H_2: There are support systems available at various levels of government to assist these farmers.

Smallholder farmers interviewed were facing challenges such as low level of technology, technical constraints and low level of financial system, as have been extensively discussed in the literature review (Chapter 2). Their constraints are also described in Chapter 4: Results and Discussion. These farmers also received the support system even though it was not enough to meet their daily farming challenges.

5.3 Recommendations

This section suggests recommendations based on the empirical results of the study. In an attempt to assist smallholder farmers to enhance their market participation; the recommended policies to assist these farmers should be considered.

5.3.1 At policy level

Several policy recommendations can be drawn from this study. A policy protecting the smallholder sector will be to the benefit of these producers. Increased international competition has resulted in a decrease in agricultural employment in the sector, because South Africa imports subsidised produce while local farmers lack full government support. The protection of the sector is often justified on the grounds that it will conserve employment (Greyling, 2012). The policy needs to stimulate market participation tailored to the requirements for participation of products. It should also formulate and implement measures to eliminate fixed transaction costs and decrease variable transaction costs.

a) Information system

The development of an information system which includes market research, prices, and transaction costs should address issues of who needs information, what kind of information, how, by whom and when the information should be made accessible. Agricultural extension officers, who can connect with the market information centres at regional or service centre level, can facilitate this. Extension officers can also help with the application of printed and electronic media to provide market information which is understandable and useful.

The relationship between extension services and farmers might be improved by developing the farmers' access to and use of cell phones. This can assist farmers to contact information centres. Smallholder farmers can be supported in this by providing them with enhanced cell reception and/or negotiating on their behalf for low-priced cell phones and subscription rates. Access to an information system should assist a farmer to become an informed decision-maker.

b) An adequate and suitable transport system

An adequate and suitable transport system is a requirement for lower transaction cost. Transport is associated with the distance to the markets, the conditions of the roads, and transport facilities such as vehicles and tractors. An adequate transport approach should address what is being transported, by whom, with what, and where to. This approach should cater for the emergence of transport contractors, the opening of road networks, the development of collection points, and investment in road infrastructure. The government should build new roads and ensure the maintenance of existing roads. Local community members should be persuaded to provide transport services to carry products to market centres or collection points.

c) Access to finance and credit

Access to finance and credit is a major factor impeding the growth and development of smallholder farmers. Raphela (2014) is of the opinion that agricultural growth is a process that involves adoption by farmers (especially smallholder farmers) of new and improved practices. This is due to the fact that much of the new technology must be purchased but few farmers have no financial resources to buy this. This includes purchasing of computer and farm equipment. Without financial power, it is impossible for smallholder famers to move forward.

d) Extension support services

The satisfaction with extension support services among smallholder farmers was found to be generally low. Their technical advice has been challenged by most of the farmers, and examples were cited showing that they could not provide technical solutions to problems with insects and moles and other constraints that were destroying their crops as well as not following up constantly to observe and assess the execution of their recommendations. It should be noted that only well-skilled and educated extension

officers within a well-managed extension programme can make a significant contribution to assisting smallholder farmers. The government should provide well trained extension officers to give some advice about fighting of moles and insects.

e) Improvement of infrastructure

The government could play a role in influencing smallholder farmers' marketing decisions by improving public infrastructure. The focus should be on improving the quality of roads, telecommunication, and marketplaces in rural areas. The poor quality of roads (e.g. bumpy or uneven gravel road) means that it takes longer for the produce to reach the market, resulting in higher transport costs. Improvement of road infrastructure could decrease travel time and transport costs allowing farmers to access distant markets.

f) Encourage value-adding

The farmers in this study specified that they do not know about or understand the significance of value-adding, which is the reason that they are not involved in such practices. Consequently, farmers should be informed about value-adding, since value-adding could unlock opportunities and increase farmers' profitability. It is vital for the farmers, the private and public sectors to develop and initiate value-adding practices for smallholder farmers. The private and public sector could help by educating the farmers about value-adding and providing financial support for the practices that require increased capital commitments and processing.

g) Stimulate government support policies in the rural areas

The smallholder farmers in South Africa, as in any developing country, face inequitable competition from the previously supported commercial farmers. They also face tough competition from internationally imported produce. For example, produce which is cheaper due to subsidy policies in developed countries is imported to South Africa. For this reason, the South African government needs to consider supporting policies and regulations that are necessary to stimulate growth among the smallholder farmers.

h) Creating markets for smallholder farmers

It is evident that the smallholder farmers that were interviewed, who are involved in vegetable production; participate in formal and informal markets. These farmers in the

City of Cape Town metropolis depend on Abelimi Bezekhaya to fetch and market their produce to local consumers. Abelimi Bezekhaya is a non-profit organisation (NGO) and acts as middleman between farmers and the market.

This study has revealed that these farmers are of the opinion that they are being cheated by the NGO who does not pay them the expected market price. Most smallholder farmers will accept the producers' price paid by the NGO because they are unaware of the actual market price. This problem could be addressed if government could establish central market areas where these farmers in vegetable production could sell their produce. In this way, government could ensure that the market is mostly owned by farmers so that they can get their money directly from the buyer.

i) Invest in human capital

From the survey, it is evident that smallholder farmers require financial, administrative, and marketing skills to become successful farmers. Training farmers to acquire the listed skills can provide much-needed ability to keep accounts and records which will improve their ability to make sensible decisions in the farming business.

j) Access to mechanisation

The study has established that levels of mechanisation in the areas are very low which is typical of many smallholder farmers in developing countries. Most respondents involved in vegetable production use hand tools (for example hoes) to till the fields and to engage in agricultural production. This contributes to low levels of production (yield) and profits. It is important for government to create a mechanisation scheme that is completely dedicated to the growth and development of these sectors. It is not likely that these farmers will be able to completely commercialise their agricultural activities without access to high levels of mechanisation.

5.4 Areas requiring further research

Although this study focused on challenges and opportunities of urban smallholder farmers in the City of Cape Town metropolis, several other concerns that warrant further research have also been identified. These include:

1) The role of agricultural extension officers in agricultural marketing requirements needs to be further investigated. There is a lack of empirical evaluation of particular marketing-associated services performed by extension workers. This attempt can be helpful to identify trainings gaps regarding marketing skills that need urgent consideration.

2) A further potential feature identified with regard to smallholder farmers is the management responsibility of the farm. Although they provide most of the labour input on their farms, they may not have sufficient knowledge on how to farm. Smallholder farmers' managerial ability is at the centre of their success, however, their ability to farm needs to be investigated.

3) There is an evidence provided (DAFF, 2012) that the smallholder sector plays a significant role in alleviating poverty, creating employment, and promoting food security. However, the smallholder sector seems to be decreasing due to the lack of a proper support system, droughts, and climate change.

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ANNEXURE A: QUESTIONNAIRE

Challenges and opportunities of urban smallholder farmers in a metropolis: A case study in the City of Cape Town.

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This questionnaire is made up of 12 sections:

1. Biographic information
2. Planning for the future
3. Production and inputs
4. Bee particulars
5. Poultry particulars
6. Financial management
7. Crops/eggs/bees
8. Organisation and control of labour
9. Risk management and adaptability
10. Use of computer
11. Marketing
12. Maintenance

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A. BIOGRAPHIC INFORMATION

A.1 DATE OF THE DATA COLLECTION dd/mm/yy **...../...../.....** 1

A.2 DISTRICT **.....** 2

A.3 PROVINCE **.....** 3

A.4 AGE **.....years** 4

A.5 FARMING EXPERIENCE **.....** years 5

A.6 HIGHEST ACADEMIC QUALIFICATION **.....** 6

A.7 FARM NAME **.....** 7

A.8 ON WHOSE LAND ARE YOU FARMING?

Choose one below		
Lease		8
Own		9
Communal		10

A.9 WHAT IS YOUR GENDER?

1. Male	11
2. Female	

B. PLANNING FOR THE FUTURE

(Answer YES or NO to every statement)

FORMULATION OF OBJECTIVE

		Yes	No	
B.1	A written annual plan, clearly describing the objectives, can be submitted			12

Listen to the farmer, evaluate his/her reply and mark the appropriate space with a cross on a scale of 1 to 5, where 1 = poorly defined and 5 is comprehensive or complete?

		Choose one					
	Farmers	1	2	3	4	5	
B.2	General aim (mission)						13
B.3	Long-term objectives (longer than 10 years						14
B.4	Medium-term objectives (2 to 5 years)						15
B.5	Short-term objectives (less than 1 yr)						16

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C. PRODUCTION AND INPUTS

C.1 What main crop did you cultivate last season? 17

C.2 Which other crop(s) did you also cultivate? 18

C.3 Do you purchase any inputs for farming? Yes/No 19

C.4 If no to question C.3, how do you get your inputs?
..... 20

C.5 If yes, please identify inputs you purchased for the last cropping season.

Choose one or more below		
Seeds		21
Herbicides		22
Implements		23
Fertiliser		24
Other		25

C.6 Do you know anything about soil types? Yes/No 26

C.7 If yes to question C.6, what is your soil types in your farm?

Choose one or more below		
Clay		27
Sandy		28
Loam		29
Sandy loam		30
Other		31

C.8 Do you use any irrigation method for farming? Yes/No 32

C.9 If yes to question C.9, please identify the method you use.

Choose one or more below		
Sprinkler		33
Drip		34
Center pivot		35
Rotary		36
Ditch		37
Other		38

C.10 Do the water source(s) supply sufficient water throughout the year? Yes/No 39

C.11 What challenges do you have on farming as a smallholder farmer?
..... 40
..... 41
..... 42

C.12 How do you deal with the encountered challenges?
..... 43
..... 44
..... 45

C.13 Have you received any support from government and other institutions?

Yes/No [46]

C.14 If yes go question C.13, What kind of support have you have received?

..... [47]

..... [48]

C.15 Do you use fertiliser? Yes/No [49]

C.16 If yes to question C.12, please identify the type of fertiliser you use.

Choose one or more below		
Inorganic		[50]
Organic		[51]
Other		[52]

C.17 What cropping method do you use in your farming?

Choose one or more below		
Monocropping		[53]
Mixed cropping		[54]
Multi-cropping		[55]
Other		[56]

C.18 Do you use methods of soil preparation? Yes/No [57]

C.19 If yes to question C.14, please identify the method.

Choose one or more below		
Manually (slash & burn, hoeing		[58]
Semi-manual		[59]
Mechanised (tractor)		[60]
Other		[61]

C.20 How do you control weeds in your crop field?

..... [62]

C.21 Where do you obtain water from?

Choose one or more below		
River		[63]
Dam		[64]
Borehole		[65]
Buy water		[66]
Other		[67]

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D. BEE PARTICULARS

D.1 Have you been approved for bee keeping practices? Yes/No [68]

D.2 Do you check local regulations for bee keeping operations? Yes/No [69]

D.3 Do you locate bees out of direct contact with people and neighbours' yards and gardens? Yes/No [70]

D.4 Do you clean and disinfect hives before new bees use them? Yes/No [71]

D.5 Do you develop a market for your honey? Yes/No [72]

D.6 Do you extract honey from the comb immediately after harvesting it? Yes/No [73]

D.7 Do you purchase bees from reputable sources? Yes/No [74]

D.8 Do you replace queens every two years? Yes/No [75]

D.9 Are you aware of pesticides that are used in the area that can kill bees? Yes/No [76]

D.10 Do you form part of the local beekeeping association? Yes/No [77]

D.11 What types of hives do you have?

Choose one or more below		
National beehive		[78]
Movable frame hive		[79]
WBC beehive		[80]
Top bar hive		[81]
Other		[82]

E. POULTRY PARTICULARS

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E.1 What chicken farming system are you practicing?

Choose one or more below		
Layers		83
Broilers		84
Other		85

E.2 Do you vaccinate chickens against diseases? Yes/No 86

E.3 If no to question E.2, please indicate the reason(s).

..... 87

E.4 Which diseases are you vaccinating for?

Choose one or more below		
Fowl Pox		88
Botulism		89
Fowl Cholera		90
Infectious Coryza		91
Infectious Bronchitis		92
Marek's Disease		93
Moniliasis (Thrush)		94
Mycoplasmosis		95
Newcastle Disease		96
Omphalitis		97
Pullorum		98
Other		99

E.5 Do you control external parasites? Yes/No 100

E.6 Do you control internal parasites? Yes/No 101

E.7 Do you experience feeding shortage? Yes/No 102

E.8 How often do your chickens drink water?

Choose one or more below		
Once a day		103
Twice a day		104
Drink any time of the day		105

E.9 Do you fix leaking water troughs? Yes/No 106

E.10 Do you disinfect and clean the housing of chickens? Yes/No 107

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F. FINANCIAL MANAGEMENT

1. ENTERPRISE AND BUDGETS

(a) What means of financial control system do you employ? 108

(c) Do you draw a balance sheet? **Yes/No** 109

(d) Do you do a cash-flow budget, and how often and how do you use it? **Yes/No** 110

(Mark with an X in the appropriate space)

		Not at all	Sometimes	Fairly often but sometimes incomplete	Most of the time but incomplete	Always and complete	
F.1	Do you draw up budget for every enterprise (crops/eggs/bees)?						111
F.2	Is a complete cash-flow budget drawn up?						112
F.3	Do you do a complete farm planning?						113

F.4 How do you decide on what type of crops/eggs/bees to farm with, and how? 114
..... 115
..... 116

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2 FINANCIAL STATEMENTS

		Not at all	Sometimes	Fairly often but sometimes incomplete	Most of the time but incomplete	Always and complete	
F.5	Do you draw up a balance sheet at the end of the financial year?						117
F.6	Do you draw up a budgeted balance sheet at the beginning of the financial year?						118
F.7	Do you draw up an income statement for business						119
F.8	Do you draw up your cash-flow statement Annually, budget for cash-flow, and Compare it to your budget						120

3. CRITERIA

	Balance sheet and efficiency analysis	Not at all	Sometimes	Fairly often	Most of the time	Always and complete	
F.9	Do you do calculation of the farming business's Solvency criteria?						121
F.10	Do you calculate your farming business's liquidity ratio?						122
F.11	Do you calculate your farming business's net worth?						123
F.12	Do you calculate efficiency criteria for your crops/eggs/bees?						124

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G RISK MANAGEMENT AND ADAPTABILTY

G.1 Can you name a few steps or measures you as a farmer are taking to reduce risk on your farm?

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H USE OF COMPUTER

H.1 Are you using a computer on your farming at this stage?

Yes **No** 136

H.2 When did you acquire the computer? ..... …….. 137

H.3 What computer programme(s) are you using for your farming system, and why did you choose this specific programme(s)? 138

Programme(s) and reasons for use

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H.4 How high would you rate yourself in terms of skills and knowledge in using the computer in your farming situation? (Scale of 0 - 10)

..... 153

H.5 How important do you as a farmer regard the use of a computer in the present day farming environment? Do you think that using a computer for planning and analysis of your farming system made it easier or more complicated?

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I. MARKETING

(Answer Yes or No to the following questions, and give a brief motivation for your answers).

I.1 Do you follow a set policy for marketing each of your products respectively?

(1) Crops

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..... 161

..... 162

(2) Eggs

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..... 165

(3) Bees

..... 166

..... 167

I.2 Do you use projections for the marketing of your products?

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I.3 Where do you get most of the information you use to do projections for marketing?

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J MAINTENANCE

J.1 Can you describe briefly how and when do you attend to maintenance tasks on your farm, such as the maintenance of fencing and windmills, care of implements, maintenance of sheds, houses, roads, etc?

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J.2 Do you follow a set maintenance plan regarding your decision about maintenance and servicing, i.e which decisions are given priority?

Yes **No**

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K. IMPACT ON THE ENVIRONMENT

K.1 Which environmental factors presently have the most influence on your farming practices?

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K.2 Which of the above do you regard as having the greatest influence at present?

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